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FINAL

ANALYSIS, INTERPRETATION, AND EVALUATION

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Lower Snake River District
Boise Field Office
3948 Development Avenue
Boise, Idaho 83705-5389
http://www.id.blm.gov

In Reply Refer To:
4100 (ID-016)

July 19, 1999

Dear Battle Creek Allotment Permittees and Interested Publics of Record:

A copy of the final Battle Creek Analysis, Interpretation, and Evaluation (AIE) is enclosed for your review. We appreciate your review of the Draft AIE and your thoughtful input to the final. Based upon your comments and the availability of new data, we have made several corrections and additions to the document. At the end of the enclosed Final AIE, we have added a brief section presenting BLM staff recommendations for future management. These recommendations were considered along with all other input when analyzing the management alternatives.

Included separately are responses to interested public's and permittee's comments to the draft AIE. Based on the comments to the draft, corrections and changes were made or incorporated into the final AIE.

Prior to selecting a preferred alternative, we prepared an Environmental Assessment that analyzed a range of alternatives based on the AIE, staff recommendations, and any additional input received from the interested publics and permittees. The preferred alternative is in conformance with the Bruneau-Kuna Management Framework Plan and the Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management, and in compliance with the State of Idaho water quality standards. It has been mailed separately with the Proposed Decisions for each Battle Creek permittee implementing grazing management and term grazing permit modifications for the Battle Creek Allotment.

Thank you for all your contributions of time, efforts, and ideas.

Sincerely,

Acting Bruneau Resource Area Manager

enclosure(s): Battle Creek Allotment Analysis, Interpretation, and Evaluation (AIE)
cc: Battle Creek Interested Publics/Permittees

10-00-4

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BATTLE CREEK ALLOTMENT

FINAL

ANALYSIS, INTERPRETATION, AND EVALUATION

Prepared By

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Lower Snake River District

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Interdisciplinary Team

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July 1999

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I. SUMMARY

The 202,490-acre Battle Creek Allotment was intensively monitored for the purposes of evaluation between 1992 and 1998 using the Bureau of Land Management's (BLM) Analysis, Inventory, and Evaluation (AIE) process. The traditional AIE approach of evaluating grazing levels and upland plant community condition was broadened to include other resource management concerns that may be affected by livestock management. These include: rangeland health of upland plant communities, riparian/aquatic habitat conditions, compliance with State of Idaho water quality standards, wildlife habitat conditions including possible impacts to special status plant and animal populations and habitats, management of cultural resources, management of Wilderness Study Areas, and recreation. Resource objectives outlined in the 1983 Bruneau Management Framework Plan (MFP), Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management, and State of Idaho Water Quality Standards were evaluated to determine if current allotment management is meeting those objectives. Long-term and short-term trends in resource conditions were identified and evaluated to determine if they were linked to livestock management practices.

Long-term trend in ecological condition for winter/early spring use areas was downward. Watershed protection was inadequate during drought conditions. Utilization was generally <50%, but distribution was poor. Long-term trend in ecological condition for mid spring use areas was static. Watershed standards were generally met except in sandy soil areas. Utilization was generally <50%, but distribution was associated with water sources. Long-term trend in ecological condition in late spring use areas was static to upward for low and low/mountain big sagebrush communities and static to upward for mountain big sagebrush communities. Watershed standards were generally met. Utilization was generally <50%; however, some mountain big sagebrush communities received moderate or heavy use. Long-term trend in ecological condition in late spring/summer use areas was static to upward for low sagebrush communities and static for Wyoming big sagebrush communities. Watershed standards were generally met. Utilization patterns were similar to late spring use areas. Long-term trend in ecological condition in summer use areas was static for low and mountain big sagebrush communities. Watershed standards were generally met. Use patterns were similar to late spring areas with concentrated use occurring in mountain big sagebrush communities.

The trend in the condition of riparian/aquatic habitat of OX Prong, East Fork Shoofly, and Shoofly creeks was static (poor or fair condition), while that of West Fork Shoofly and Little Jacks creeks was upward. Shoofly and East Fork Shoofly creeks flowed through areas of fine-grained soils, which were more susceptible to livestock impacts than cobble-dominated segments elsewhere on the allotment. OX Prong and the upper portions of Little Jacks Creek were in poor condition because of summer-long grazing use. Little Jacks Creek met State of Idaho water quality criteria for cold water biota and secondary contact recreation. Redband trout were abundant in Little Jacks Creek. Shoofly and East Fork Shoofly creeks partially met State criteria for cold water biota, but did not meet State criteria for fecal coliform bacteria during 1994-95, and 1997. Abundance of redband trout in the Shoofly Creek drainage appeared to decrease from 1980 to 1995.

II. INTRODUCTION

A. Purpose of the Evaluation

The BLM has used AIEs since 1985 for monitoring purposes. Currently, AIEs are an interdisciplinary process used to evaluate the environmental effects of current grazing management. Through the AIE process we determine whether grazing management is accomplishing specific land use management objectives. This AIE report provides the technical rationale for making necessary adjustments in livestock management in order to meet management objectives.

Some of the questions asked in the AIE process include:

What is the current grazing capacity of the allotment?

What effect, if any, is livestock grazing management currently having on resource values, such as riparian habitat, water quality, special status species or their habitat, cultural sites, and recreation areas?

Are we attaining or moving towards attaining our land use plan objectives under current resource allocation and management? If not, what management actions are needed and what ecological constraints exist?

The AIE summarizes historic resource inventory and survey data. Results were used to determine if grazing practices in the Battle Creek Allotment (Map 1) met:

1. Objectives established in the 1983 Bruneau MFP; and

2. State of Idaho Water Quality Standards for the designated beneficial uses of streams in the allotment.

3. Fundamentals of rangeland health as identified in 43 CFR 4180.1.

4. Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management, approved by the Secretary of the Interior on August 12, 1997.

When this report is completed, we will explore with permittees and other interested public ways to adjust management to help meet land use plan objectives, the fundamentals of rangeland health, and water quality standards where they are not currently being met. Management actions could include changes in season-of-use, specialized grazing systems, reductions in permitted livestock numbers, and/or construction of additional range improvements.

Public workshops will be held to help develop agreement on how best to achieve management objectives and standards. If agreement cannot be reached between affected parties we will issue a Grazing Decision to implement appropriate recommendations from the AIE. The decision will be subject to protest and appeal.

This is a technical report, portions of which may be difficult to understand for those readers unfamiliar with technical terms and statistics. We have provided a glossary of scientific and technical terms and an appendix of general statistical concepts (Appendix A).

B. Allotment Location

The Battle Creek Allotment is located in Owyhee County southeast of Grand View, Idaho (Map 1). The allotment extends southwest about 35 miles into the Owyhee Mountains, and averages about 12 miles in width. It is bordered by Shoofly Creek on the northwest, Little Jacks Creek on the east, and C.J. Strike Reservoir on the north. Elevations range from approximately 2,400 feet in the Snake River Plain near C.J. Strike Reservoir to 6,660 feet at Bald Mountain.

C. Background Information

During the 50-60 year period preceding and immediately following the turn of the century, large numbers of cattle, sheep, and horses were grazed in the area, often on a year round basis. Consequently, there was high intensity of use in areas where water was available and these areas suffered. Since that time, all of the sheep and most of the horse use has been converted to cattle.

BLM efforts to assess resource conditions and implement appropriate grazing management in the Battle Creek Allotment began with the 1962 General Watershed Plan, 1966 Pole Creek Adjudication, and subsequent 1970 Allotment Management Plan (AMP) (Fig. 1). Many of today's resource concerns in the Battle Creek Allotment were identified in these early documents.

1962 Boise District General Watershed Plan

A series of watershed plans were completed in the mid-1960's, identifying major resource problems related to grazing and prescribing programs to correct the problems. These programs included the adjudication of AUMs, construction of range improvement projects, and AMP development.

1966 Pole Creek Adjudication

A forage survey was completed for the Pole Creek Unit to determine grazing capacity as a basis for adjudication. Battle Creek Allotment's portion of this unit was rated at 12,908 AUMs for federal land, and divided as follows:

Summer Use Area	3,700 AUMs
Spring-Fall Use Area	7,890 AUMs
Winter Use Area	600 AUMs
FFRs	718 AUMs

1969 Livestock Grazing Capacity and Distribution

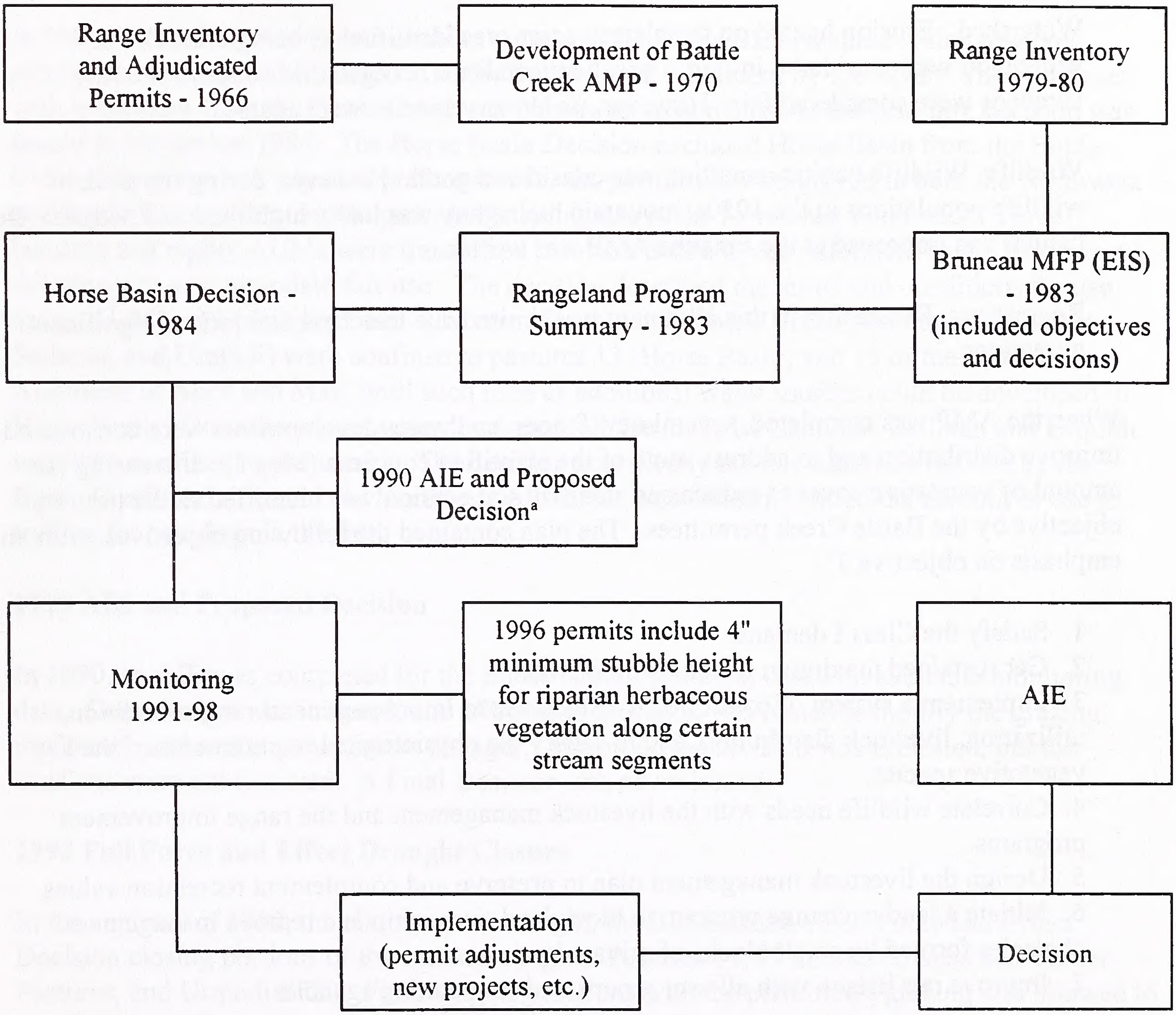
The inventoried grazing capacity in 1965 totaled 14,608 AUMs, including 1,700 AUMs in Horse Basin and 718 AUMs within Fenced Federal Range (FFR), while the preference total was 13,386 AUMs; an under-obligation of 1,222 AUMs. The canyon areas were deleted from the grazing capacity due to unsuitability, but no reduction in capacity was made as a result of lack of water in pastures 9, 10, and Horse Basin.

Concentrated grazing was associated with availability of water, steepness of slope, and amount of rock on the surface. Spring use began around April 1 in the lakebeds area, north of the plateau scarp. Cattle would move up country as weather conditions allowed. Cattle were generally off of the lakebeds after May 1, and beginning to use the lower plateau and canyons.

During June, cattle moved to the higher plateaus, working towards Battle Creek and then crossing over to summer range on or around the first of July. Summer range received continuous use through September, with some areas receiving October use as well. Winter use was made on the lakebeds around Little Valley and C.J. Strike Reservoir from November through February.

Heavy use was made in all areas of available water. Areas with little water, such as pastures 9 and 10, received little or no use. In good water years pasture 22 would get moderate use, but in dry years that area received little to no use, especially in the north end. In drier summers, water was hauled to Grassy Flat (summer range).

It was estimated in 1969, that the spring range received heavy or moderate use on over 50% of the area, light use on 20%, and little to no use on 20-30%. This pattern was primarily due to water distribution and availability, and the steep rocky terrain. The summer range received moderate to heavy use on approximately 70% of the area, and light use on the remaining 30%.


Range Inventory and Adjudicated Permits - 1966
Development of Battle Creek AMP - 1970
Range Inventory 1979-80
Horse Basin Decision - 1984
Rangeland Program Summary - 1983
Bruneau MFP (EIS) - 1983 (included objectives and decisions)
1990 AIE and Proposed Decision[a]
Monitoring 1991-98
1996 permits include 4" minimum stubble height for riparian herbaceous vegetation along certain stream segments
AIE
Implementation (permit adjustments, new projects, etc.)
Decision

[a] Proposed decision was protested and final decision was not issued.

Fig. 1. Land use planning and implementation process for the Battle Creek Allotment.

1970 Battle Creek AMP

BLM and the grazing permittees approved an AMP for the Battle Creek Allotment in 1970. The AMP was developed to address the following problems:

> Watershed: Erosion hazard on the plateau scarp was identified as being critical, but vegetation was considered in fair to excellent condition. Vegetation conditions in the lakebeds were considered fair. However, understory species were sparse.
>
> Wildlife: Wildlife habitat condition was considered good. However, during the peak of wildlife populations in the 1950s, mountain mahogany was badly highlined and hedged. Deer habitat had improved at the time the AMP was written.
>
> Recreation: Recreation in this allotment was limited due to access and lack of significant attractions.

When the AMP was completed, several new fences and water developments were constructed to improve distribution and to address some of the identified concerns (Map 3). Increasing the amount of vegetative cover to reduce and stabilize soil erosion was identified as the primary objective by the Battle Creek permittees. The plan contained the following objectives, with an emphasis on objective 3:

1. Satisfy the Class I demand.
2. Get sustained maximum livestock production.
3. Implement a system of controlled livestock use to improve general range condition, utilization, livestock distribution, and to satisfy the physiological requirements of the key vegetative species.
4. Correlate wildlife needs with the livestock management and the range improvement programs.
5. Design the livestock management plan to preserve and complement recreation values.
6. Initiate a land exchange program to block land ownership and remove management obstacles formed by small blocks of private land.
7. Improve our liaison with all user groups and cooperating agencies.

1983 MFP and Bruneau-Kuna Grazing EIS

In 1975 a Natural Resources Defense Council lawsuit and subsequent Court-ordered Agreement required BLM to prepare site-specific grazing Environmental Impact Statements (EIS) in compliance with the National Environmental Policy Act (NEPA). The Agreement also required BLM to cease further implementation of AMPs pending completion of the EIS. As a result, the 1970 Battle Creek AMP was suspended.

The Bruneau MFP is the land use plan for the Battle Creek. It incorporated the findings of the Bruneau-Kuna Grazing EIS. The MFP and associated management objectives were developed with full public participation and involvement. The MFP is the land use plan that currently directs management for the Battle Creek Allotment.

1984 Horse Basin Decision

In 1984, the BLM initiated consultation to resolve the Horse Basin dispute which revolved around an area that had been added to the Battle Creek Allotment by the AMP. The BLM met with permittees from the Battle Creek and Northwest allotments and the resulting decision was issued in November 1984. The Horse Basin Decision excluded Horse Basin from the Battle Creek Allotment, and adjusted preferences for the permittees who grazed in both the Northwest and Battle Creek allotments to provide for spring use in the Northwest Allotment. Three-hundred and eighty AUMs were transferred from the Battle Creek Allotment to the Northwest Allotment to accommodate this use. The decision described the terms and conditions for use areas, AUMs, and periods of use. Use areas for the three Battle Creek permittees (Lahtinen, Sellman, and Urquidi) were confined to pastures 13 (Horse Basin) and 15 of the Northwest Allotment in April and May, until such time as additional water sources could be developed in Horse Basin. Once the waters were developed, all use made by Lahtinen, Sellman and Urquidi would be confined to pasture 13. The decision specifically did not authorize fall use by the Battle Creek permittees in the Northwest Allotment, and instead, limited the amount of use to trailing for two days in the fall.

1990 AIE and Proposed Decision

In 1990, an AIE was completed for the Battle Creek Allotment based on available monitoring data. Consultation was initiated, and a Proposed Decision was issued to modify the grazing preference and make management changes. The proposed decision was protested, but the conflicts were not resolved. A Final Decision was never issued.

1992 Full Force and Effect Drought Closure

In the summer of 1992, the sixth year of drought, the BLM issued a Full Force and Effect Decision closing portions of the summer range in Pastures 10, 15 and 16 (Owens and Turner Pastures, and Urquidi FFR). Following negotiations with the permittees, grazing was allowed to continue providing water was hauled by permittees. Following compliance inspections, livestock were ordered to be removed one month earlier than scheduled when it became apparent that supplemental water hauling would not be sufficient to prevent further degradation to the riparian habitat in the headwaters to Little Jack's Creek.

D. Allotment Description

There are three major landforms in the allotment. The Snake River Plain or lakebed landform (predominantly composed of deposited lakebed sediments) occurs at the northern end of the allotment. The mountain landform (canyonlands and steeper slopes between the lakebed and plateau landforms) occurs in the central portion of the allotment. The plateau landform occurs at the southern end of the allotment. The allotment contains 17 ecological sites associated with these landforms (Table 1).

The Owyhee Mountains in Battle Creek Allotment are drained by several perennial and intermittent streams including: Shoofly, Battle, Little Jacks, and Dry creeks.

Table 1. Ecological sites with associated plant communities and landforms in the Battle Creek Allotment.

Name[a]	Pristine Plant Community	Landform
Calcareous Loam 7-10	Shadscale/Indian Ricegrass	Lakebeds
Saline Loamy 8-12	Greasewood/Basin wildrye	Lakebeds
Saline Meadow	Greasewood/Saltgrass	Lakebeds
Saline Silty 7-10	Nuttall saltbush/Indian ricegrass	Lakebeds
Silty 7-10	Winterfat/Indian ricegrass	Lakebeds
Sandy 8-12	Fourwing saltbush/Indian ricegrass	Lakebeds
Loamy 10-13	Wyoming big sagebrush/Bluebunch wheatgrass	Mountain, Plateau
Sandy Loam 8-12	Wyoming big sagebrush/Indian ricegrass	Lakebeds
Shallow Stony 8-12	Black sagebrush/Thurber's needlegrass	Lakebeds, Mountain
Loamy 13-16	Mountain big sagebrush/Idaho fescue	Mountain, Plateau
Loamy 16+	Mountain big sagebrush/Idaho fescue	Mountain, Plateau
Loamy Bottom 12-16	Basin big sagebrush/Basin wildrye	Mountain, Plateau
Loamy Upland 12-16	Basin big sagebrush/Idaho fescue	Plateau
Shallow Claypan 12-16	Low sagebrush/Idaho fescue	Mountain, Plateau
Mountain Mahogany 16-20	Mountain mahogany/Idaho fescue	Mountain, Plateau
Stony clayey 12-16	Low sagebrush/Idaho fescue	Plateau
Semi-wet Meadow	Carex	Mountain, Plateau

[a] Names describe the major site characteristics and average annual precipitation (inches).

E. Present Situation

1. Allotment status by pasture (land ownership)

The Battle Creek Allotment is currently composed of approximately 148,540 acres of BLM land, 11,640 acres of State of Idaho land, and 42,310 acres of private land (Map 4). Pastures 1-7, 11, 13, and 17 are private lands within the allotment where grazing is not administered by BLM.

2. Forage Allocation

All livestock forage in the Battle Creek Allotment is allocated for cattle. The proposed action in the Bruneau-Kuna Grazing EIS identified a need to reduce the active grazing preference (13,386 AUMs) by 15% to establish an "initial livestock allocation" of 11,282 AUMs. This proposed adjustment in forage allocation was carried forward into the preliminary steps of the Bruneau MFP. However, prior to the final MFP being approved, BLM established a new policy that prohibited the use of a one-point-in-time inventory as the sole basis for allocating forage. Because such an inventory was the basis for the proposed action in the EIS and the preliminary recommendation in the MFP, the final MFP decision was to 1) reject that recommendation, 2) establish the initial livestock use level at the 1976-80 licensed active use level, and 3) base any subsequent adjustment in AUMs on monitoring and other reasonable requirements. The final MFP decision included a recommended implementation schedule as shown in Table 2; however, due to a lack of conclusive monitoring data, the recommended reductions were not implemented.

Table 2. Forage allocation schedule recommended in the MFP, subject to monitoring.

5-Year (1976-80) Licensed Use	Adjustment (%) From 5-Year Licensed Use	Implementation Schedule				
		Year 1	Year 3		Year 5	
		AUMs	AUMs	%	AUMs	%
13,290	-15	13,290	12,625	-5	11,282	-10

3. Permittees and Grazing Preference

The current total preference for the nine permits in the Battle Creek Allotment is 13,006 AUMs (Table 3). Prior to 1985 the total active preference was 13,386 AUMs. The current total active preference for three permits in the Battle Creek Allotment was adjusted in 1984 under the Horse Basin Decision.

Table 3. Total preference, active grazing preference, and suspended use for individual permittees in Battle Creek Allotment (1985-present).

Permittee	Total Preference	Active Preference[d]					
		Spring	Summer	Winter	FFR	Suspended Use	Total
Bruneau Cattle Co.	7,021	3,491	3,530	0	0	0	7,021
Black[a]	782	413	369	0	0	0	782
Simplot - Battle Creek	3,395	1,696	1,699	0	0	0	3,395
Lahtinen	816	203[b]	613	0	0	0	816
Sellman	453	113[b]	340	0	0	0	453
Urquidi[c]	264	50[b]	0	0	214	0	264
Field	120	0	0	120	0	0	120
Gillespie	89	0	0	89	0	0	89
Owyhee Calcium Products	66	0	0	66	0	0	66
Total	13006	5966	6551	275	214	0	13006

[a] Leased to Bruneau Cattle Co.

[b] Spring use for these permittees is for June only.

[c] Leased to Rubelt.

[d] Active preference by season is an estimate based on total preference and length of season of use. Current term grazing permits reflect total preference, but do not split active preference by season of use or pasture.

4. Season-of-Use

Seasons-of-use vary between permittees in the Battle Creek Allotment (Table 4). Turnout is currently subject to range readiness, but cannot occur before April 1 for three permittees, June 1 for three permittees, and November 1 for three permittees (Map 5). Seasons-of-use are based on the phenology of important forage species in the allotment (Fig. 2). Heads showing (boot stage) is considered the critical growth period for perennial grasses.

5. Allotment Categorization

Allotments were grouped so that priorities could be developed for the distribution of available funds and personnel to achieve the most cost effective improvement of rangelands. The Battle Creek Allotment was identified for "intensive management" in the Bruneau-Kuna Grazing EIS and Bruneau MFP. The criteria used to designate allotments for "intensive management" included a predominance of public land, high resource values/conflicts, and potential for increased forage production and improved range condition. AMPs with specified grazing systems, levels of grazing use, seasons-of-use, and range improvement projects were expected to be implemented on "intensive management" allotments within 10 years.

Table 4. Battle Creek Allotment seasons of use by permittee.

Permittee	Spring	Summer	FFR	Winter
Bruneau Cattle Co.	4/1-6/30	7/1-9/30	7/1-10/15	
Black	4/1-6/30	7/1-9/30		
Simplot - Battle Creek	4/1-6/30	7/1-9/30	7/1-10/15	
Lahtinen	6/1-6/30	7/1-9/30		
Sellman	6/1-6/30	7/1-9/30		
Uriquidi	6/1-6/30		7/1-10/15	
Field				11/1-1/31
Gillespie				11/1-1/31
Owyhee Calcium Products				11/1-1/31

6. Other Resource Concerns

Most resource concerns were adequately identified in the Bruneau-Kuna Grazing EIS and Bruneau MFP. The only significant resource concern not previously addressed in these documents is the requirement to meet Idaho water quality standards (established after the EIS and MFP were completed). BLM is responsible under the Federal Clean Water Act to monitor water quality of streams on lands it manages and to implement best management practices to meet State of Idaho water quality standards.

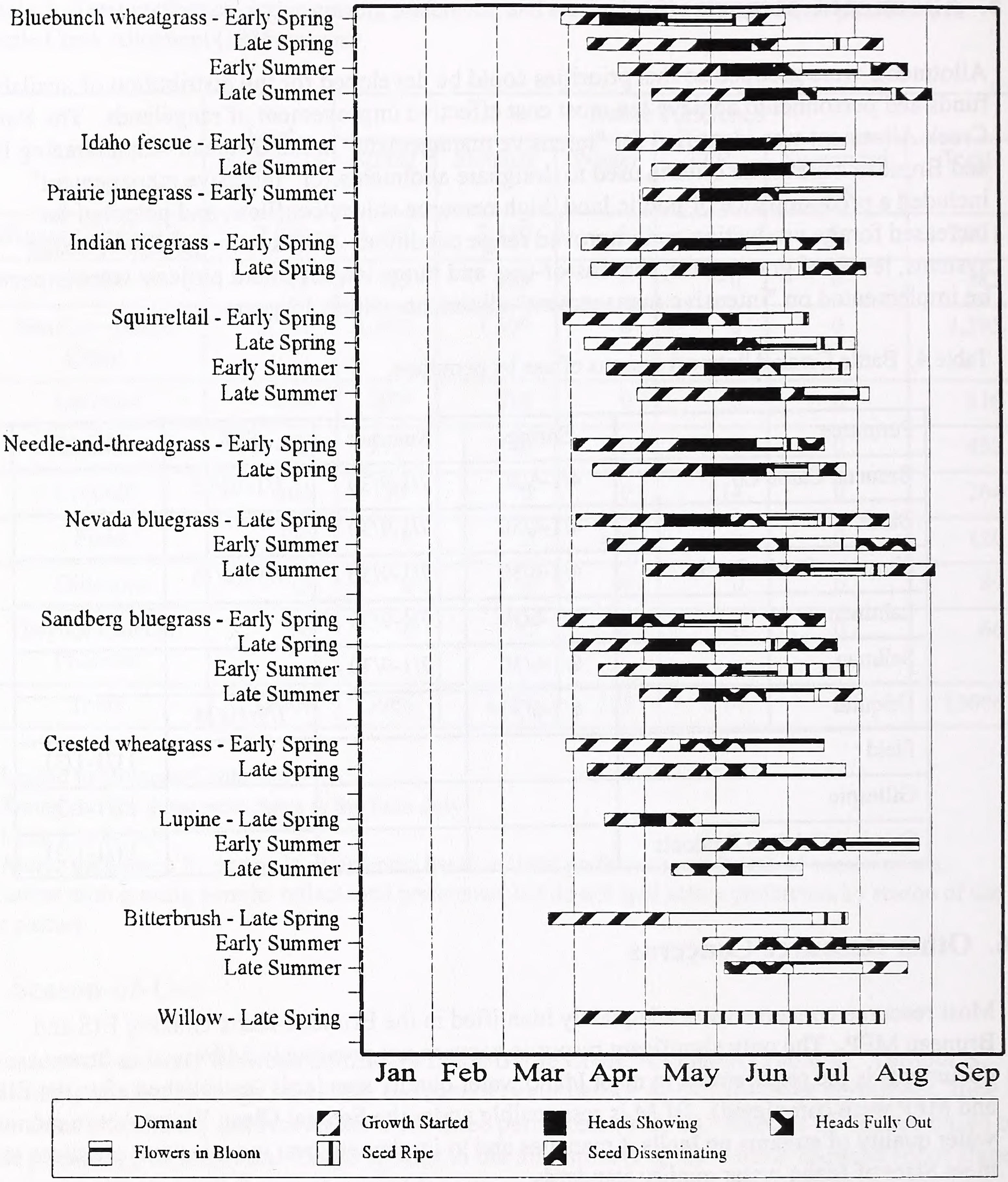


Fig. 2. Phenology of rangeland forage plants in the Battle Creek Allotment by season of use.

7. Guidance Documents

The following documents were examined for objectives and management guidelines to be considered in this evaluation:

a. Bruneau-Kuna Final Grazing EIS (USDI 1982)
b. Bruneau MFP (USDI 1983a)
c. Rangeland Program Summary (RPS) (USDI 1983b)
d. Battle Creek AMP 1970 (canceled 1976)
e. Boise District General Watershed Plan (USDI 1962)
f. Idaho Non-point Source Management Program (Clark 1990)
g. Boise District Phenology Study (USDI 1968b)
h. Horse Basin Decision (USDI 1984)
i. 1990 AIE and Proposed Decision (USDI 1990)
j. Fundamentals of Rangeland Health (43 CFR 4180 1995)
k. Interim Management Guidelines for Lands Under Wilderness Review (USDI 1995)
l. Idaho Standards for Rangeland Health and Guidelines for Livestock Management (1997)
m. Idaho Sage Grouse Management Plan (IDFG 1997)

8. BLM Decisions/Agreements

June 1966: Decision established the active grazing preference of Battle Creek Allotment within the Pole Creek Unit at 12,931 AUMs. BLM did not impose a reduction to the estimated grazing capacity, but anticipated a shift of any over-obligation to other administrative units having surplus forage. At the time of the adjudication, the Battle Creek Allotment did not appear to be over-obligated.

May 1969: BLM prepared an AMP based on the District Phenology Study concerning turnout dates (Map 6). Seed ripe was assumed to be July 20. Spring/early summer pastures would be used in spring and fall in alternate years. Range readiness was not considered in establishing turnout dates because of the deferred-rotation grazing system. The seasons-of-use were:

Spring use area-lower portion (pasture 21, Horse Basin) - April 1 to April 30
Spring/early summer use area-upper portion (pastures 9,10, 11, 12, 14, 15, 18) - May 1 to July 19
Summer use area (pasture 20) - July 20 to September 30
Fall use area (same pastures as spring/early summer) - October 1 to October 30
Winter use area (pasture 8) - November 1 to January 31

November 1970: BLM approved the Battle Creek AMP as agreed to by the Battle Creek permittees. The AMP included a substantial water development program. The AMP was canceled in 1976 because of the court ordered agreement in the Natural Resources Defense Council lawsuit.

November 1984: BLM issued the Horse Basin Decision. This decision transferred 380 AUMs from the Battle Creek Allotment to the Northwest Allotment to facilitate establishment of a use area within the Northwest Allotment for three Battle Creek permittees.

No formal division of the allotment between the permittees was made. However, the Horse Basin Decision implied that three Battle Creek permittees would have exclusive use of pasures 10, 15, and 16.

August 1992: A Full Force and Effect Decision closed pastures 10 and 16. Grazing was allowed in portions of pasture 15 where water was hauled. Pasture 15 was closed when compliance checks indicated continued use of riparian areas on Little Jacks Creek. Pastures 10, 15, and 16 remained closed the remainder of the summer.

February 1997: The grazing permits for the nine permittees were renewed for a period of two years pending completion of the Battle Creek AIE with the additional stipulation that a four inch stubble height of herbaceous riparian vegetation remain on certain segments of OX Prong and Little Jacks Creek at the end of the growing season. One appeal was received on the permits and its status is currently pending.

III. OBJECTIVES

Management objectives were first formulated for the allotment as part of the 1970 Battle Creek AMP. Most of these objectives were general in nature and dealt primarily with livestock and watershed management. Although the AMP was canceled in 1976, the objectives for management continued. New management objectives were developed for the 1983 Bruneau MFP. The MFP included objectives for range, wildlife, fisheries/aquatic, watershed, recreation, and cultural resources in the Battle Creek Allotment. These objectives, in addition to other legal requirements, were used as a basis for analysis in this document. The MFP objectives are described in detail in the evaluation section (VI). The 1984 Horse Basin Decision affirmed the objectives for the affected portions of the Battle Creek Allotment.

BLM grazing regulations were modified in August 1995. Current regulations under 43 CFR 4180 require the authorized officer to ensure that the identified fundamentals of rangeland health exist. The Secretary of the Interior approved the Idaho Standards for Rangeland Health and Guidelines for Livestock Management in August 1997. These Standards and Guidelines apply to grazing permits in the Battle Creek Allotment.

IV. GRAZING SYSTEM AND PASTURE USE SUMMARIES

Thirteen pastures in the allotment with public land were used at various times between April 1 and January 31 (Table 5). The allotment was used during spring and summer by two groups of permittees and during the winter by a third group. Separate use areas were informally established for the spring/summer permittees and for each of the winter permittees.

Spring/Summer Group A

Livestock are turned out into pasture 8 (Map 5) on April 1 each year depending on range readiness. Depending on range readiness, cattle are generally pushed into pasture 21 between May 1 and May 10.

Once livestock are in pasture 21, full livestock numbers for the year are generally present. Almost immediately, livestock begin to drift up into pasture 22 and Shoofly Creek. Generally, by the first week of June, the remaining livestock are pushed into pasture 22. Pasture 9 can be grazed during this time, but limited use occurs due to the lack of water. Efforts are made to push the livestock out of Shoofly Creek into pastures 22 and 12. By mid June, livestock begin drifting across West Fork Shoofly Creek into pasture 12.

Pastures 14 and 20 are grazed in a deferment system. Pasture 14 supports approximately one month (July or September) and pasture 20 supports approximately two months (July-August, August-September) of use each year. When pasture 14 is used in July, cattle in pasture 12 are weaned first and moved into pasture 20. Cattle in pasture 22 are moved into pasture 14, weaned during July then moved into pasture 20. When pasture 14 is used in September, cattle in pasture 22 are weaned first and moved to pasture 20, then cattle in pasture 12 are weaned and moved into pasture 20. Livestock are moved to the FFR pastures from summer ranges between September 30 and October 5. In late October permittees begin trailing back to Bruneau and Grand View.

FFR pastures 18 and 19 are used from June through October as livestock are moved in and out of pastures 14 and 20. Pastures 11 and 17 have no public land and use occurs at the permittees discretion. These pastures are primarily used for separating and working livestock, but varying numbers of cattle remain in these pastures throughout the summer.

Spring/Summer Group B

Late spring use begins June 1 when livestock from the Northwest Allotment are moved into pastures 10 and 15. Livestock drift between these two pastures throughout the summer. On July 1 some livestock are moved from pastures 10 and 15 into pasture 16 (FFR). Livestock are permitted to graze in pasture 16 until October 15. Permittees begin trailing cattle through the Northwest Allotment back to Bruneau on September 30.

Winter Group

Livestock are turned out into winter range (pastures 8, 8A, and 21) beginning November 1 and remain until January 31, depending on forage availability and weather conditions.

Table 5. Season of use of pastures on the Battle Creek Allotment.

Pastures	Season of Use
8	Early Spring (April 1 - May 10) Winter (November 1 - January 31)
8A	Winter (November 1 - January 31)
21	Mid and Late Spring (May 1 - June 10) Winter (November 1 - January 31)
9, 12, 22	Mid and Late Spring (May 1 - July 10)
14, 20	Summer (July 1 - September 30)
10, 15	Late Spring (June 1 - June 30) Summer (July 1 - September 30)
FFR Pastures: 16, 18, and 19	Summer/Winter (July 1 - October 15)

V. ANALYSIS

A. Methods and Descriptions of Historical Information Sources

1. Actual/Licensed Use

Actual use numbers were based on Actual Use Grazing Reports completed by livestock operators (to document livestock numbers and period of use in a pasture) and grazing licenses (grazing bills issued to permittees by BLM). Licenses were potentially inaccurate records of actual use because they did not always reflect changes in use that an operator made during the grazing season. Information from grazing licenses was used only when actual use reports were not available for all permittees.

Use at total preference was calculated by dividing the total federal acres within a given seasonal use area by the total number of permitted AUMs.

2. Climate

Climatic data from National Oceanic and Atmospheric Administration (NOAA) weather stations at Silver City and Grand View, Idaho were used. These stations represented lower and upper elevation extremes found in the allotment. Yearly precipitation totals were determined between September and August to reflect plant growing seasons.

3. Key Species

The Battle Creek AMP designated certain perennial plants as key species in each pasture (Table 6). The designations were consistent with the ecological roles of the various species, except for winterfat, bitterbrush, and mountain mahogany. These species are decreasers relative to less palatable shrubs, but are increasers relative to perennial grasses.

Table 6. Key species for Battle Creek Allotment with associated pastures and livestock use periods.

Key Species	Pastures	Season of Use
Indian ricegrass Bluebunch wheatgrass	9, 10, 12, 14, 15, 21, 22	Spring
Bluebunch wheatgrass Idaho fescue Bitterbrush Mountain mahogany	20	Summer/Fall
Winterfat Indian ricegrass	8, 8A	Winter

4. Range Condition

a. Trend

Trend of vegetation in upland communities was determined by comparing successive range condition inventories, successive samples of vegetation at established sites (nested plot frequency transects), photographic records (photo plots, view photos), and field comparisons (fenceline contrasts).

Historic Condition Mapping

Range conditions in the Battle Creek Allotment have been evaluated several times since 1959. Inventory methods varied, but were generally based on the relative depletion of decreaser grasses. The condition ratings were primarily based on relative composition by weight of decreaser grasses compared to the total weight of the vegetation in the community (Table 7). The 1980 condition map was updated to include areas where wildfires burned during the period 1981-98; although referred to as the updated 1980 condition map, no ESI has been done since

1980 in the allotment.. Ground cover was grouped into communities with like understories using cluster analysis. The 1980 vegetation map was converted to a map of those communities.

Nested Plot Frequency Transects (NPFT)

Nested plot frequency transects and photo trend plots were established and read in 1983 to determine successional trends in sampled native plant communities (Map 7). Transects were also read in 1987, 1990, 1994, and 1998.

Permanently-staked 100-foot transects (baselines) were established within key areas in different seasons of use. Four permanent 100-foot belts were randomly placed along the baseline with the 50-foot mark centered on the baseline. A fifth belt was added in 1990. The belts were sampled with a 50X50 cm frame that contained 4 nested plots of successively larger size. The frame was read at 5-foot intervals along each belt. Each time a plot was read, each plant species was recorded for the smallest plot within which it occurred. Nothing was recorded for frames where a given species was absent. A 3 foot by 3 foot (3X3) photo trend plot was established along the baseline and view photos were taken at the ends of each NPFT.

Trends in frequency were determined for key species using Chi-square analysis (refer to Appendix A for explanation of statistical terms and concepts). The frequency of each species occurring in a particular size plot was compared between years at each study site. When possible, observed frequencies from 20-80 percent were analyzed. Frequencies in plot size four were used in graphs for comparison purposes. Bonferroni Z tests were used to determine which plant frequencies differed from expected values. Differences were considered significant if probability values were < 0.05.

Photo Plots/View Photos

A photo was taken and a diagram was drawn of plants within a permanently located 3X3 foot plot. The photo and diagram were repeated over time and the loss, breakup, establishment, and/or annual fluctuation in size of individual plants was determined. Trends in frequency were based on observed gains and losses in grasses and shrubs.

View photos were taken at each end of a NPFT and abundance and vigor of perennial grasses and shrubs were visually compared between years.

Table 7. Range condition inventories conducted on the Battle Creek Allotment from 1959 to 1994 with a description of the methods used and parameters sampled for each inventory.

Inventory	Year Completed	Method of Mapping into Units	Scale/ Minimum Size	Method of Determining Condition	Sampling Method/ Measurements
Deming Two-Phase	1959	Broad geographic pattern of depletion of decreaser grasses	Unknown	Relative depletion of perennial grasses	Ocular estimate of condition relative to pristine areas
Pole Creek Unit Forage Survey	1966	Major vegetation types or vegetation complexes based on dominant overstory and understory plants	≥160 ac	Relative depletion of decreaser bunchgrasses, degree of dominance of increaser bunchgrasses, and invasion of annuals.	Ocular estimate of degree of depletion or from clipping studies
ESI/U2	1980	Soil unit maps completed in 1980 were subdivided by the 1979 condition boundaries. In some cases boundaries of condition classes were modified using forage production data from 1980	≥6 ac, but averaged 135 ac	Percent of community composed of decreaser grasses (on a weight basis)	Plant weight determined by clipping plants and also ocular estimates
Update of 1980 ESI	1997	Same as 1980 ESI with addition of wildfires	averaged 135 ac	Same as 1980 ESI	Same as 1980 ESI
Ecological Site Inventory (ground cover data)	1980	Same as 1980 ESI	>6 ac, but averaged 135 ac	Ground cover of decreaser and increaser perennial grasses	Step-point cover transects

Cover

Perennial grass (decreaser, increaser), biological soil crust, and bare ground cover data were used to examine watershed and soil erosion conditions. Perennial grass cover was recorded when the live portion of the crown was encountered. During the 1973-74 and 1979-80 condition inventories, percent cover was estimated by walking transects and recording the type of cover located at a notch in the end of the observer's boot at designated pace intervals along the transect (step-point ground cover method). In 1973-74, 100 points per transect were used, and in 1979-80, 100 to 200 points per transect were used to estimate the percent cover. Ground cover (decreaser and increaser grass, persistent and nonpersistent litter, rock, gravel, biological soil crusts, bare ground) was recorded at 400 points (4 points at each of the 100 sub-samples) at each NPFT study (320 cover points were read on transects conducted prior to 1988).

Average percent ground cover and the 95% confidence interval (CI) were determined for decreaser and increaser grass and bare ground by sample year and season-of-use. Two means differ significantly from each other if their 95% CIs do not overlap. The width of the CI provides a relative measure of the amount of variation in the samples from which the mean was calculated.

The condition of a watershed could be based, in part, on the amount of bare ground present. Fifty percent bare ground, based on canopy cover, represents a historical (BLM Manual 7441) breakpoint between somewhat stable conditions and rapidly increasing sediment yield. There is no currently accepted standard. Bare ground cover can fluctuate substantially in communities dominated by cheatgrass; therefore, increaser and decreaser grass cover provides a more stable indicator of watershed condition. Canopy cover fluctuates substantially with growth conditions, utilization, and season; therefore, ground cover is a more reliable indicator of watershed condition.

b. Utilization/ Use Pattern Mapping

The Grazed Class Method and Key Forage Plant Method were used to determine livestock utilization for upland perennial grasses (USDI 1996). Both methods were used prior to 1994, whereas the Key Forage Plant Method was used exclusively after 1993. Both methods measured use on current year's growth. Utilization measurements were most reliable in areas where use occurred after plant growth was completed (summer use). Failure to account for regrowth could result in underestimates of utilization in spring use areas. Utilization is also underestimated when use of residual plant material is not recorded.

The Extensive Browse Method was used to determine shrub utilization. Utilization of herbaceous riparian species was determined using the Key Forage Plant Method and from stubble height measurements (Cowley 1992). Mean utilization (±2 standard deviations (SD)) was reported by species to show both the average and range of utilization for a given pasture or season-of-use. In general, the mean ± 2 SD includes 95% of the values in a sample. The size of the interval calculated by the mean ± 2 SD reveals whether use was uniform across the pasture (narrow interval) or whether portions of the pasture were lightly or heavily used relative to other areas of the pasture (wide interval).

The Key Forage Plant Method for determining utilization of perennial grasses was used to delineate utilization boundaries in use pattern mapping. Average utilization was calculated by summing use levels and dividing by the number of years monitoring occurred within a given area. The average use map depicts where consistent use occurred. The maximum level of use observed in a given area during use pattern mapping indicated potential livestock concentration areas.

c. Forage Production Based Stocking Levels

Forage Production Estimates

Forage production surveys were conducted in 1965 and 1980. Production was estimated using the weight estimate method. The above ground portion of plants within a 9.6 ft^2 circular sub-plot was clipped, air-dried, and weighed to estimate production. In 1965, a combination of clipped and ocular estimate plots were used to estimate production of areas stratified into similar vegetation community types. In 1980, production was estimated for ten sub-plots within a 1-2 acre area representative of a given ecosite, plant community, and range condition class. At least two of these plots were clipped to estimate production. Production on the other sub-plots was visually estimated, using the clipping studies to calibrate the estimates. The 1965 production inventory was conducted and mapped on a coarser scale than the 1980 survey (Table 7).

Potential stocking levels (Appendix C) were determined by multiplying the forage production estimate for a plant species by its proper use factor (Appendix B) to get forage production that could be allocated. Proper use factor represents the percentage of the current year's production that was allocated to livestock grazing during a given season-of-use. Allocatable forage production estimates for each species in a plant community were summed to estimate the total allocatable forage for that community for a given season-of-use. The potential stocking level for a pasture was calculated by summing the allocatable forage for all plant communities with differing ecological condition ratings and on different ecological sites in that pasture.

Proper use factors and the pounds of forage/AUM differed between the 1965 and 1980 production surveys. The potential stocking levels derived from the two surveys were adjusted so they were directly comparable to each other (Appendix C). The 1980 figures were adjusted to normal precipitation, but the 1965 figures were not. Allocation limits of 50% for perennial grasses and 20% for cheatgrass were used to assess trend in forage production. Allocation limits of 50% for both perennials and annuals were used to determine if permitted use levels conformed to the MFP watershed objective. The relative contribution of annual grasses to the total production was determined by comparing the adjusted and unadjusted figures for 1980.

d. Determination of Trend in Ecological Condition

Trend in ecological condition was based on historic condition maps, NPFT data, photo plots, view photos, cover data, and forage production. Increasing perennial grass and static or declining shrub populations was considered an upward trend in ecological condition. Static perennial grass and static or declining shrub populations was considered a static trend in ecological condition. Downward perennial grass and static or upward shrub populations was considered a downward trend in ecological condition. Influences of grazing were inferred when accompanied by utilization and climatic data and information about the timing of the treatment from grazing licenses or compliance checks.

5. Riparian/Aquatic Habitat

a. Riparian/Aquatic Habitat Inventory

Riparian/aquatic habitat on perennial and intermittent streams in the Battle Creek Allotment was inventoried from 1994-97. The habitat inventory consisted of three monitoring levels: an extensive survey, a reconnaissance level survey, and monitoring of riparian habitat parameters at representative study sites.

Extensive Survey

Streams were divided into segments having similar characteristics (Cowley 1992, Myers 1989). Information used to identify stream segments included topographic maps, National Wetland Inventory Maps, aerial photos, allotment maps, soil maps, and existing data and management plans. By delineating uniform stream segments, representative sample sites could be used to quantify habitat conditions for an entire segment.

Reconnaissance Survey

The length of each stream segment identified in the extensive survey was walked during the reconnaissance level survey to: 1) determine if the segment was adequately delineated or if it needed to be further subdivided, 2) identify and map vegetation communities by dominant overstory and understory plant species, 3) visually estimate stream bank and stream channel stability, and stream substrate composition, and 4) locate intensive monitoring sites (Cowley 1992). Streams without specific land use plan objectives for riparian/aquatic habitats were evaluated to determine if they were in proper functioning condition (USDI 1993). Stream segments with ephemeral flows were not evaluated for functioning condition.

Riparian/Aquatic Habitat Monitoring

Riparian and aquatic habitat parameters were quantified using BLM and Idaho State Division of Environmental Quality approved sampling protocols (Cowley 1992, Vinson 1992, Myers 1989).

Habitat monitoring was conducted on 200 foot (61 m) long transects located at representative sites within the stream segments identified during the two riparian/aquatic surveys. Transects were placed along the greenline. Habitat features monitored included: 1) greenline vegetation community types; 2) age composition of woody shrubs; 3) stream bank stability; 4) herbaceous stubble height; 5) stream width and depth; 6) substrate composition (including percent fine sediment in stream); 7) percent in-stream fish cover (adult fish); 8) percent stream shading; and 9) ratio of pools to riffles. Additionally, stream gradient, bankfull width and depth, floodprone width, and stream sinuosity were measured to identify stream channel types (Rosgen 1994). Averages were calculated for the different habitat parameters for stream segments grouped by seasons of grazing use and accessibility to livestock.

The composition of riparian plant communities on Shoofly Creek was examined in 1998 by measuring the length of each plant community along the greenline on about a 0.5 mile length of stream in pasture 21. An observer walked along the stream and tallied the number of paces along the greenline occupied by a particular plant community type. Each plant community was then assigned to a stage of plant succession based on the composition of the community type (USDA 1992). Successional status of the stream (very early, early, mid, late, and potential natural community) was then determined by comparing the amount of late successional plant community types to that expected based on stream gradient and substrate features (USDA 1992).

A greenline stability rating was also calculated for Shoofly Creek by multiplying the percent composition of each community type along the greenline by the stability rating for that type (USDA 1992). Stability ratings ranged from 1 (for those types least capable of buffering the forces of moving water) to 10 (for those types with the highest buffering capability). An overall stability index was calculated and then compared to the following rating classes: 1-2 - very low, 3-4 - low, 5-6 mid, 7-8 - high, 9-10 - excellent (USDA 1992).

Riparian Shrub Monitoring

Riparian shrub cover was monitored at three sites on Shoofly Creek and one at Chokecherry Spring to determine trend in growth/utilization levels of riparian shrubs (Map 8). A 0.5 × 2 m board with 0.5 by 0.5 m squares alternately painted dark and light colors was used to estimate vertical plant cover by placing the board behind a shrub and estimating the percent of the board obstructed by the shrub. Four shrubs were monitored at each sample site and photos were taken of each plant to document trends in plant cover. The sites were monitored for ≥ 10 years. Photoboard monitoring sites were selected independently of the stream segments that were selected for greenline transects. The riparian shrub monitoring was used to independently evaluate the fisheries habitat condition ratings developed from reconnaissance surveys and greenline transects and to examine trends in riparian shrub cover.

Riparian/Aquatic Habitat Condition

Riparian/aquatic habitat conditions were evaluated in 1994-97 using stream/fisheries habitat standards outlined in the MFP (USDI 1982, 1983a). The condition of stream segments identified in the MFP to be improved from poor or fair condition were compared to their condition at the time of the MFP inventory. Six habitat components were used to determine stream/riparian habitat condition: 1) percent stream shading from woody and herbaceous vegetation and topographic features (Vinson 1992); 2) percent bare ground (streambank cover) and height of herbaceous vegetation ; 3) percent unstable streambanks (streambank stability); 4) stream channel stability (estimate of the amount of channel scouring, widening, and lateral movement); 5) percent of fine sediment covering the stream bottom (sedimentation); and 6) percent instream cover for adult fish (provided by pools, stable undercut banks, boulders, overhanging vegetation).

These habitat parameters were quantitatively measured on the greenline transects with the exception of stream channel stability which was estimated visually from aerial photographs or during reconnaissance surveys of the stream segment. We recorded channel stability as one of the four categories outlined in the MFP Fisheries Physical Habitat standards for comparison with the 1983 MFP habitat rating. The average amount of unvegetated streambank was combined with the average stubble height of herbaceous vegetation measured at the greenline site at the end of the growing season to calculate the stream habitat rating for streambank cover. Trend in riparian/aquatic habitat condition was determined by comparing the condition of streams in 1983 to the condition determined in 1994-95. The habitat components that were used to determine the overall riparian/aquatic habitat ratings were also examined individually and compared to MFP standards.

Chi-square tests were used to determine whether the number of stream miles in poor, fair, and good condition differed from previous surveys and if the number of stream miles in each condition category differed among grazing seasons of use. One-way analysis of variance was used to test for differences in the means of individual riparian/aquatic habitat components (such as percent stream shading) for stream segments with different seasons of grazing use and livestock accessibility. If significant differences occurred, Tukey HSD post-hoc tests were used to determine which pairs of means were different. Probability values of ≤ 0.10 were considered significant.

Spring Condition

Vegetation, presence and condition of development, and accessibility to and impacts from livestock were recorded during field visits of springs in the allotment.

b. Fish Population Sampling

Fish populations were sampled in perennial streams at the locations of greenline transects and at historic fish sample sites using a Smith-Root Model 15-A backpack electrofisher (Map 8). Five stream sites in the allotment were originally sampled (two in Little Jacks, three in Shoofly Creek) during 1980 to determine fish abundance. These sites or adjacent sites were resampled during 1994-96 to examine changes in redband trout numbers in the Shoofly and Little Jacks creeks drainages. Additionally, three new sites were sampled in the Shoofly Creek drainage, and five new sites were sampled in Little Jacks Creek.

At each site, three passes were made with the electrofisher, capturing and segregating fish from each pass. All fish were measured to the nearest millimeter, and redband trout (*Oncorhynchus mykiss gairdneri*) were weighed to the nearest gram, before they were released. Population sizes were estimated using the Zippin removal model (Zippin 1958). Population estimates were calculated for all redband trout and for the adult portion of the population. Redband trout > 100 mm in length were considered to be adult fish ($\geq$ 1-year old).

The length of stream sampled was measured at each site and average stream width was calculated from three measurements of stream width taken at the top, middle, and bottom of the sample reach to calculate population densities. We used density estimates and their 95% confidence interval (CI) for each stream segment in a drainage, and the length and average width of the stream segments, to estimate the total number of redband trout in the Shoofly and Little Jacks Creek drainages. Differences between average population densities in 1994-95 and 1980 for the same stream segments were examined using t-tests.

We used linear regression and correlation analyses to examine the relationship between redband trout density and fisheries habitat condition and proportion of pool habitat available. The fisheries habitat rating used was the total numerical score for six habitat parameters (stream shading, low streambank cover, streambank stability, channel stability, percent of fine sediment covering the stream bottom, and percent instream cover for adult fish), with each parameter receiving a score of 1 for poor, 2 for fair, 3 for good, and 4 for excellent condition (USDI 1982). Distribution of species was determined from the fish sampled at electrofishing sample sites and from visual observations of fish during aquatic/riparian habitat monitoring.

To estimate potential population sizes, we used a linear regression equation relating redband trout density to stream habitat condition and % of the channel comprised of pools: $Y = 0.019 (X_1) + 0.01 (X_2) - 0.21$, where Y = population size, X_1 = habitat condition rating (1-24), and (X_2) = % pools ($R^2 = 0.68$, df = 17, $P < 0.001$). This regression is based on trout density and habitat data collected from four streams located on the northern slopes of the Owyhee Mountains (Castle, Little Jacks, Shoofly, and East Fork Shoofly creeks). To make predictions on potential population sizes, we used a value of 18 for habitat condition (the mid-point of the good condition category), and 40 for percent of the channel comprised of pools.

c. Water Quality Monitoring

Water quality sampling was conducted on most stream segments identified in the riparian/aquatic habitat inventory. Occasionally short segments (< 0.9 mi long) were grouped with adjacent segments and samples were collected from the furthest downstream segment. Water quality parameters measured included temperature and fecal coliform bacteria levels. Fecal coliform samples were collected during the grazing season and in most cases before grazing started. State of Idaho water quality criteria (Idaho Administrative Procedures Act [IDAPA] 16.01.02.250) were evaluated to determine if beneficial uses (IDAPA 16.01.02.101) of streams on the allotment were being protected.

Beneficial uses designated for streams on the allotment included agricultural water supply (waters which are suitable or intended to be made suitable for the irrigation of crops or as drinking water for livestock), secondary contact recreation (waters which may be used for fishing, boating, wading, and other activities where ingestion of raw water is not probable), salmonid spawning (waters which provide or could provide a habitat for active self-propagating populations of salmonid fishes), and cold water biota (waters which are suitable or intended to be made suitable for protection and maintenance of viable communities of aquatic organisms and populations of significant aquatic species which have optimal growing temperatures below 18° C).

We monitored temperature during the summer months to determine if streams were meeting State of Idaho water quality criteria for cold water biota. We did not monitor water quality during the early spring (during salmonid spawning) to evaluate whether streams were meeting water quality criteria for salmonid spawning. Fecal coliform levels were monitored to determine if water quality criteria for secondary contact recreation were being met.

Water quality criteria for cold water biota are water temperatures at or below 22° C with a daily average temperature of not greater than 19° C (IDAPA 16.01.02.250.02.c). Water quality criteria for secondary contact recreation are fecal coliform bacteria levels not in excess of 800 bacterial colonies/100 ml water at any time, and not in excess of 400 colonies/100 ml water in more than 10% of the total samples taken over a 30 day period (IDAPA 16.01.02.250.01.b). The beneficial use attainment categories of fully supported, supported but threatened, partially supported, and not supported (Clark 1990) were used in evaluating compliance with these criteria.

6. Wildlife Habitat Inventories

a. Endangered, Threatened, and Sensitive Species

The Bruneau MFP requires that sensitive species be managed to maintain or increase existing and potential populations. Inventories, consultation with the Conservation Data Center (CDC), personal communications with specialists, museum records, published literature, and BLM records were used to determine the occurrence of special status species (endangered, threatened, species of special concern, sensitive species) in the Battle Creek Allotment.

Interior Redband Trout

Inventories of redband trout populations and aquatic habitat condition are addressed in the section addressing riparian and aquatic habitat inventory.

Spotted Frog

Streams, ponds, and reservoirs in the Bruneau Resource Area were surveyed for Columbia spotted frogs (*Rana luteiventris*) in 1993 and 1994 by Boise State University (BSU) research associates (Munger et al. 1996) and in 1998 by BLM staff. Sites were selected for survey based on National Wetland Inventory maps and accessibility. Surveys were conducted in Little Jacks, Rock, Battle, and Dry creeks. Bodies of water were searched for frogs by examining all shallow and bank areas, watching for sudden movement, turning rocks and vegetation, and dip netting for larvae and eggs.

Habitat condition and trend ratings were derived from fisheries habitat data collected during riparian/aquatic inventories and riparian photoboard monitoring sites.

Mountain Quail

Mountain quail (*Oreortyx pictus*) are found at higher elevations than the more common California quail (*Laphortyx californicus*). In Idaho, they inhabit drainage thickets, with or without water, mixed evergreen forests, and uplands above streams. The IDFG conducted call response surveys for mountain quail in the Shoofly Creek drainage during the spring of 1991. Using a Stewart Game Caller, BLM personnel conducted response surveys in both the East and West Forks of Shoofly Creek, OX Prong, and uplands above Little Jacks Creek in the spring of 1997. Condition of riparian habitat and associated uplands was used to determine condition of mountain quail habitat.

Kit Fox

Potential kit fox (*Vulpes macrotis*) habitat is limited to salt desert shrub communities. Trend photos, NPFT studies, shrub densities, the updated 1980 condition rating, and other methods were used to establish condition, trend, and potential for change in salt desert shrub communities.

California Bighorn Sheep

Critical habitat for California bighorn sheep (*Ovis canadensis californiana*) was identified during the land use planning process. Condition ratings for these areas were based on the updated 1980 condition rating. Trend was determined by trend photos, NPFT studies, and fenceline contrasts. Research is presently being conducted to determine if competition for forage resources and habitat occurs between livestock and bighorn sheep.

b. Big Game

Mule Deer

The MFP contains objectives for mule deer (*Odocoileus hemionus hemionus)* winter/early spring ranges and spring/summer/ fall ranges. Winter habitat was determined by the following factors: food availability, snow depth, temperature, wind, and the amount of protective cover. Winter habitat was divided into two types: general winter habitat and crucial winter habitat. Crucial winter ranges were areas within general ranges where mule deer retreat as winter conditions become severe. Seasonal ranges were areas used by mule deer in spring, summer and fall.

Habitat monitoring was conducted on both winter and seasonal ranges. Habitat condition of these ranges was analyzed using the updated 1980 ecological condition rating, browse utilization levels, and trends in age and form class of bitterbrush and mountain mahogany.

Extensive browse transects (USDI 1984) were established in pastures 10, 12, 14, 15, 18, 20, and 22 to examine utilization levels, availability, and population structure of browse plants. Transects were established and monitored in each pasture containing mule deer winter or seasonal ranges. Separate transects were placed in winter and seasonal ranges if a pasture contained both. Data were compiled in 1994, 1996, and 1997 for utilization level, form class, and age class structure.

In 1979, 19 transects were established and monitored for the MFP. In each transect, 25 plants were examined for form class and age structure only. Utilization was not monitored at that time. Some extensive browse transects were established in the general area of the 1979 transects.

- Browse Utilization

Ten randomly chosen leaders were examined for use on each plant in a transect. Each utilized leader represented 10% utilization of a plant (e.g., 3 used leaders out of 10 sampled, equaled 30% utilization). Utilization for a transect equaled the average for the 100 plants sampled. In winter range, transects were read after spring/summer livestock use, and the following spring after deer use, but prior to livestock turnout. In summer range, transects were sampled in July before livestock were thought to start consuming browse, but in some cases, cattle use of browse had already begun. Some transects were resampled after livestock and deer use occurred.

Browse utilization in deer winter and summer range was calculated from the average utilization of the transects in each range. The mean utilization for the transects in each seasonal deer range (± 95% confidence interval (C.I.)) was compared to MFP utilization standards of 30% and 50% browse utilization for deer winter and seasonal ranges, respectively.

- Browse Form Class

Form class is a description of the availability of resources of a browse plant and the influence of utilization on the growth form of that plant. Form classes are categorized as all available (entire plant is available for use), partially available, or unavailable (USDI 1984).

Form Classes:

1 - All available, little or no hedging
2 - All available, moderate hedging
3 - All available, severely hedged
4 - Partially available, little or no hedging
5 - Partially available, moderate hedging
6 - Partially available, severely hedged
7 - Unavailable
8 - Dead

Data were analyzed for winter and seasonal deer ranges. Differences in the level of hedging and availability between years were analyzed using Chi-square and Bonferroni Z tests. The influence of livestock season of use on browse growth form and availability was also determined using Chi-square and Bonferroni Z tests. Browse transects were stratified by cattle season of use and the level of hedging was compared between years.

- Browse Age Class

Age class data were collected to examine the establishment, survival, and decadence of key browse plants. Each browse plant encountered on a transect was assigned to one of four age classes: seedlings (plants with basal stem diameter < 0.125 inches), young (≥ 0.125, but < 0.5 inches basal stem diameter), mature (> 0.5 inches basal stem diameter), and decadent (>50% of canopy was dead). Plants in the seedling category were 1-3 years old, young plants were < 10 years old, mature and decadent plants were > 10 years old (USDI 1984). Differences between years in the number of plants in each age class for winter and seasonal deer ranges were analyzed using Chi-square and Bonferroni Z tests. The influence of different seasons of livestock use on population structure was also determined using Chi-square and Bonferroni Z tests. Browse transects were stratified by cattle season of use and the population structure was compared between years.

Pronghorn

During winter conditions, pronghorn (*Antilocapra americana*) are rarely found on foothill terrain, preferring relatively flat alluvial fans. Winter habitat condition is most important to pronghorn and was identified in the MFP. Habitat condition was evaluated using the updated 1980 ecological condition rating. Trend photos, NPFT studies, cover point data, and fenceline contrasts were used to determine trend of ecological condition.

c. Upland Game

Sage Grouse - Wintering Habitat

Wintering sage grouse (*Centrocercus urophasianus*) populations are either migratory or nonmigratory. Migrations relate to snow depth and sagebrush abundance and palatability. Sage grouse winter habitat in the Battle Creek Allotment was identified in the MFP. Minimum requirements for acceptable winter and nesting habitats are explained in the Idaho Sage Grouse Management Plan (IDFG 1997).

Sage Grouse - Lek/Nesting Habitat

Sage grouse strutting grounds (leks) were identified during inventories conducted in the late 1970s. Surveys on known leks and searches for additional leks were conducted from 1994 to 1997. Due to snow conditions in early spring, some leks known to have birds were not surveyed. Each lek that could be reached was visited in the spring of 1996 and 1997. IDFG personnel conducted aerial surveys for sage grouse leks during the spring of 1995.

Nesting habitat is identified as the area within a two mile (3.2 km) radius of a lek. Nests are generally located under a sagebrush or other shrub in the best canopy cover available in the area. Hens will travel as far as necessary to find suitable nesting habitat. General habitat conditions were based on the updated 1980 condition rating and herbaceous utilization levels as determined by use pattern mapping in 1994-96.

Sage Grouse - Brood Rearing Habitat

Wet meadows in pastures 10, 12, 14, 15, 20, and 22 were surveyed during fall 1997. National Wetland Inventory Maps were used to identify meadows to be sampled. Meadows were selected if they were within 5 miles of an active or historic lek. Stubble height of grasses, observations of habitat condition, and photographs were made for each site. Habitat ratings were based on stubble height measurements: poor - <2 inches, fair - 2 to 4 inches, good - >4.

Three wet meadow sites along Dry Creek were intensively sampled in 1998. Circular plots (0.1 acre) were established and vegetation canopy cover was estimated by species in one of 13 cover classes (T = <1%, 1 = 1-5%, 2 = 6-10%, 3 = 11-19%, 4 = 20-29%, 5 = 30-39%, 6 = 40-49%, 7 = 50-59%, 8 = 60-69%, 9 = 70-79%, 10 = 80-89%, 11 = 90-95%, 12 = 96-100%)(Cooper et al. 1991). Where structural diversity was great, canopy cover totals could exceed 100%. Soil profile to a 36 inch depth was determined with the aid of a soil auger. Topography, hydrology, and geomorphic valley forms were also recorded. A functional rating and trend were determined based on hydrologic, vegetation, and soil-erosion deposition characteristics.

The same three meadow were assessed for proper functioning condition using established BLM procedures for lentic riparian-wetland areas (USDI 1994). Ecological sites were classified by landscape position, water table depth, and soil profile characteristics (Weixelman et al. 1996) and were used to evaluate meadow capability and potential. Adjacent to each vegetation plot (in a dominant cover type), a 4-inch diameter hole was augered to a maximum depth of 36 inches or to where gravel stopped the auger. Soil layers were described in terms of color, texture, structure and consistence (feel), and root diameter and relative abundance.

Weixelman et al. (1997) identified six meadow ecological types on Forest Service lands in Nevada using the following distinguishing characteristics: landform, soil suborder, depth to mottles, depth to soil saturation (water table), soil temperature (50 cm depth), elevation and soil texture. Chambers et al. (1999) also used landscape characteristics, particularly the depth of water table and other soil properties, to characterize meadow ecosystems. Data collected on meadows adjacent to Dry Creek were used to compare the meadows to the types defined in the Nevada classification system.

Natural-color aerial photographs (approximate scale 1:30,000) taken in July 1976 and July 1991 were used to assess the amount of bare ground relative to vegetative cover, and changes in the amount of channelization in the meadows.

7. Sensitive Plant Species

Locations of sensitive plant species were determined from BLM inventories and the IDFG Conservation Data Center. The locations of these species were examined in relation to the updated 1980 condition rating, use patterns of livestock, and grazing seasons of use. Long-term monitoring of sensitive plant populations has not occurred in the allotment.

8. Cultural Resources

A Class I Overview for the Boise and Shoshone Districts (Gehr 1982) provided a comprehensive literature search of historical, archaeological, and ethnographic sources for the Battle Creek Allotment.

Portions of the Battle Creek Allotment were surveyed during several systematic inventories for cultural resources including the Class II Cultural Resource Inventory of the Owyhee, Bruneau, and Jarbidge Resource Areas, Boise District BLM (Young 1984); Pacific Power and Light Survey (Pavesic 1977); Bruneau River Inventory (Hill and Pavesic 1973); and Foothills Land Exchange (Palmgren 1993).

Based on a total allotment size of 202,490 acres, cultural resource inventories surveyed the following percentage of the allotment:

Class II Survey	11,050 acres	5.46 %
Pacific Power & Light	257 acres	0.13 %
Foothills Land Exchange	160 acres	0.08 %
Bruneau River Inventory	640 acres	0.32 %
Totals	12,107 acres	5.99%

In addition to these surveys cultural resource site data have been gathered on a project specific basis in compliance with Section 106 of the National Historic Preservation Act of 1966. The acreage inventoried in small compliance related surveys was not determined.

Native American site types recorded in the Battle Creek Allotment include lithic scatters, rockshelters, hunting camps, rock alignments, and habitation sites. Historic site types include can scatters, dumps, roads and trails (including a portion of the South Alternate of the Oregon Trail), and standing remains of historic structures.

Locations of known cultural sites, based on BLM records, were compared with the 1992-97 maximum livestock utilization, livestock season of use, 1994-95 stream functioning class, and range improvement projects to determine potential effects of livestock use on cultural resources.

9. Recreation

Recreation use for the Battle Creek Allotment was derived from BLM's Recreation Management Information System (RMIS 1997), an annually updated recreation database that gives visitor use estimates by type of recreation activity for developed and undeveloped recreation sites as well as dispersed (not related to specific sites) use. Recreation use numbers in RMIS are collected using a combination of direct observation, trail and boater registration forms, Special Recreation Permit uses, and projections of estimated use based on a variety of sources, including the Idaho Department of Fish and Game special hunt permits by unit. Also used was the State of Idaho's Comprehensive Outdoor Recreation Plan (SCORP 1990), that describes recreational use by region of the state, and projects recreational demands and facility needs for the future.

B. Results

1. Range and Watershed Condition by Season of Use

a. Non-Use Areas (Pastures 8B, 8C)

Prior to 1970 these areas were used from November through February. Since 1970, substantial portions of these pastures were converted to agricultural use or included in the C.J. Strike Wildlife Management Area (WMA). These areas, approximately 5,100 acres, were not grazed in recent years because of lack of water and control over livestock drift.

b. Winter (November 1 - January 31) Use (Pastures 8, 8A, and 21)

The MFP objective for winter use areas indicated that vigor, density, and production of desirable vegetation should be increased. However, in 1983 the BLM recognized that decreaser grasses (Indian ricegrass, needle-and-threadgrass, Thurber's needlegrass) were so depleted that increasing their density and production was unlikely even with management changes. Therefore, BLM management chose to emphasize increasing the vigor, density, and production of the remaining increaser perennial grasses (squirreltail, Sandberg bluegrass).

Range improvements, trend, and potential stocking levels are incorporated in the early and mid spring use sections. Separate use pattern mapping following winter use was not completed based on the minimal winter use authorized. Only pasture 8A was grazed exclusively in the winter.

Actual Use/Climate

Combined winter use in pastures 8, 8A, and 21 ranged from 25 to 937 AUMs between 1980 and 1997 (Fig. 3). Winter use in pasture 8A ranged from 86 to 121 AUMs between 1988 and 1997. Precipitation ranged from 3.7 to 10.8 inches at the Grandview weather station with below average (6.1 inches) precipitation occurring in 9 of 18 years (Fig. 3).

Potential Stocking Levels Based on Forage Surveys

Forage production ratings were static between 1965 and 1980 when adjustments were applied for different allocation factors (Maps 17, 18). The 1980 inventory grazing capacity for pasture 8A was 84 AUMs (Table 8).

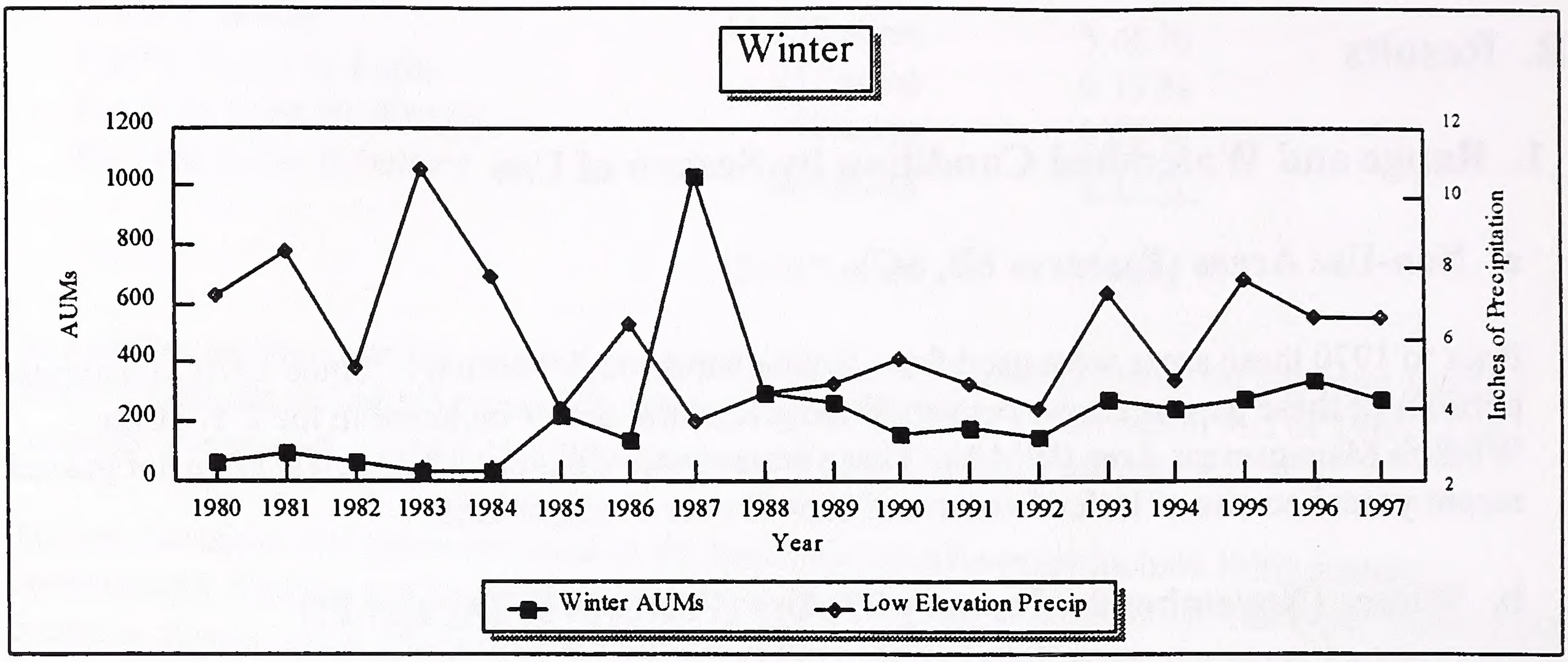


Fig. 3. Actual livestock use (AUMs) and yearly precipitation (Grand View weather station) in winter pastures, Battle Creek Allotment, 1980-97.

Table 8. Potential stocking levels (AUMs) based on 1965 and 1980 forage production surveys for pasture 8A, Battle Creek Allotment.

	1965	1980
Unadjusted[a]	61	84
Adjusted[b]	62	50

[a] Unadjusted stocking level for 1965 assumed 40% allocation of perennial grasses and 20% allocation for annual grasses. Unadjusted stocking levels for 1980 assumed 50% allocation for perennial and annual grasses, consistent with the MFP.

[b] The 1965 and 1980 figures were adjusted to allocate 50% of perennial grass and 20% of annual grass production to livestock.

c. Early Spring (April 1 - 30) Use (Pasture 8)

Remnant Indian ricegrass and winterfat populations were identified in the 1970 AMP for management emphasis. The MFP objective for range management of areas with depleted understory vegetation was to increase vigor, density, and production of desirable vegetation, particularly remnant perennial grasses. Sites with remnant decreaser grass populations should be managed to improve ecological condition.

Actual Use/Climate

Actual use records were combined for all spring use pastures between 1980 and 1989 (Fig. 4). Actual use in pasture 8 ranged from no use to 1,816 AUMs between 1990 and 1997. No spring use occurred between 1990 and 1994 because of drought conditions. Use at total preference would result in a stocking level of 13.5 ac/AUM. Precipitation ranged from 3.7 to 10.8 inches at the Grandview weather station with below average (6.1 inches) precipitation occurring in 9 of 18 years (Fig. 4).

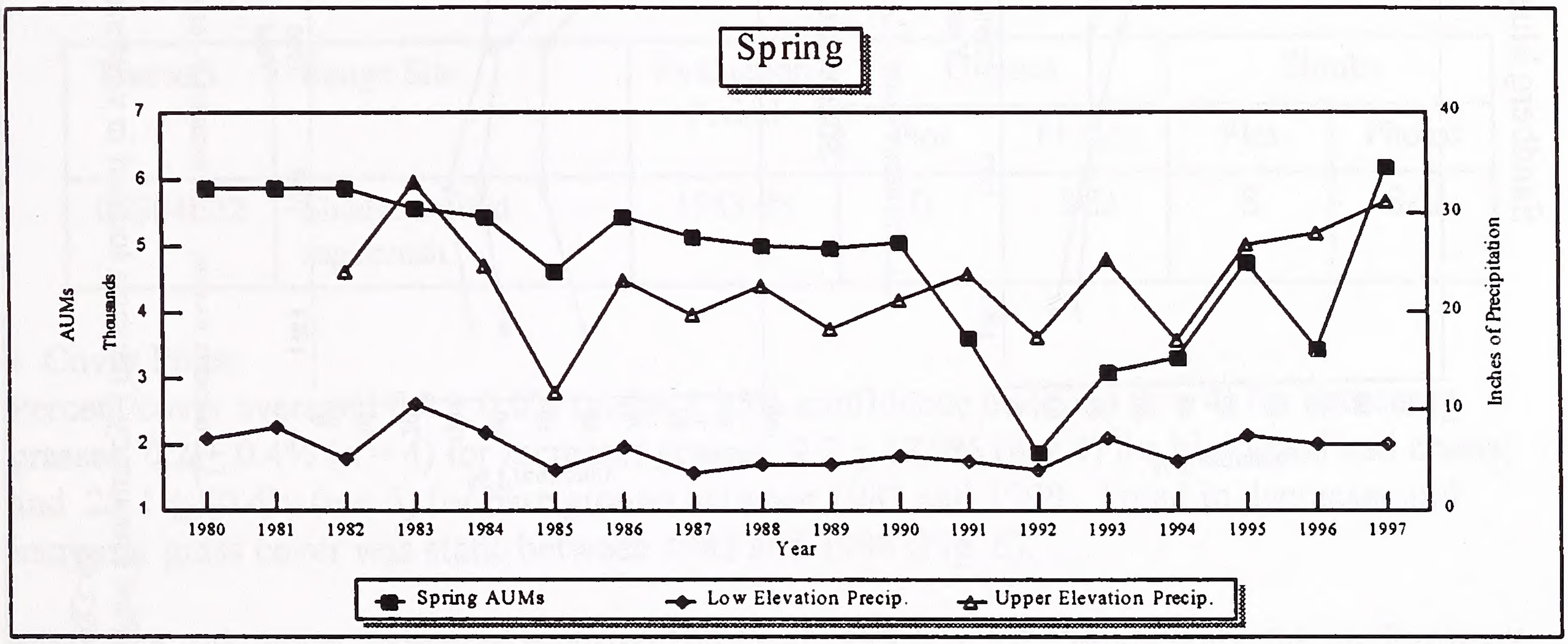


Fig. 4. Actual livestock use (AUMs) and yearly precipitation (Grand View and Silver City weather stations) in spring pastures, Battle Creek Allotment, 1980-97.

Trend

- Historical Condition and Vegetation Mapping

Winter/early spring pastures have been rated in poor condition since 1959 (Maps 9-11). However, the 1959 and 1980 surveys identified pockets of better condition communities. These pockets generally received limited livestock use because of steep slopes or distance from natural water sources. Scattered populations of Indian ricegrass occurred in the north portion of pasture 8, but were not reflected in the condition maps. A 135 acre fire burned in 1987 (Map 12).

- NPFT Studies

One transect (06S04E32) was established in pasture 8 in 1983 (Map 7). Frequency of squirreltail, an increaser grass, declined from 1983 to 1998 (Fig. 5) (Appendix A). Similar mortality in squirreltail occurred between 1987 and 1990 on other trend sites located in pasture 21 and adjacent pastures in the Castle Creek Allotment.

Trend in frequency of bud sagebrush was downward between 1983 and 1998 (Fig. 5). Trend in frequency of shadscale was upward between 1983 and 1998.

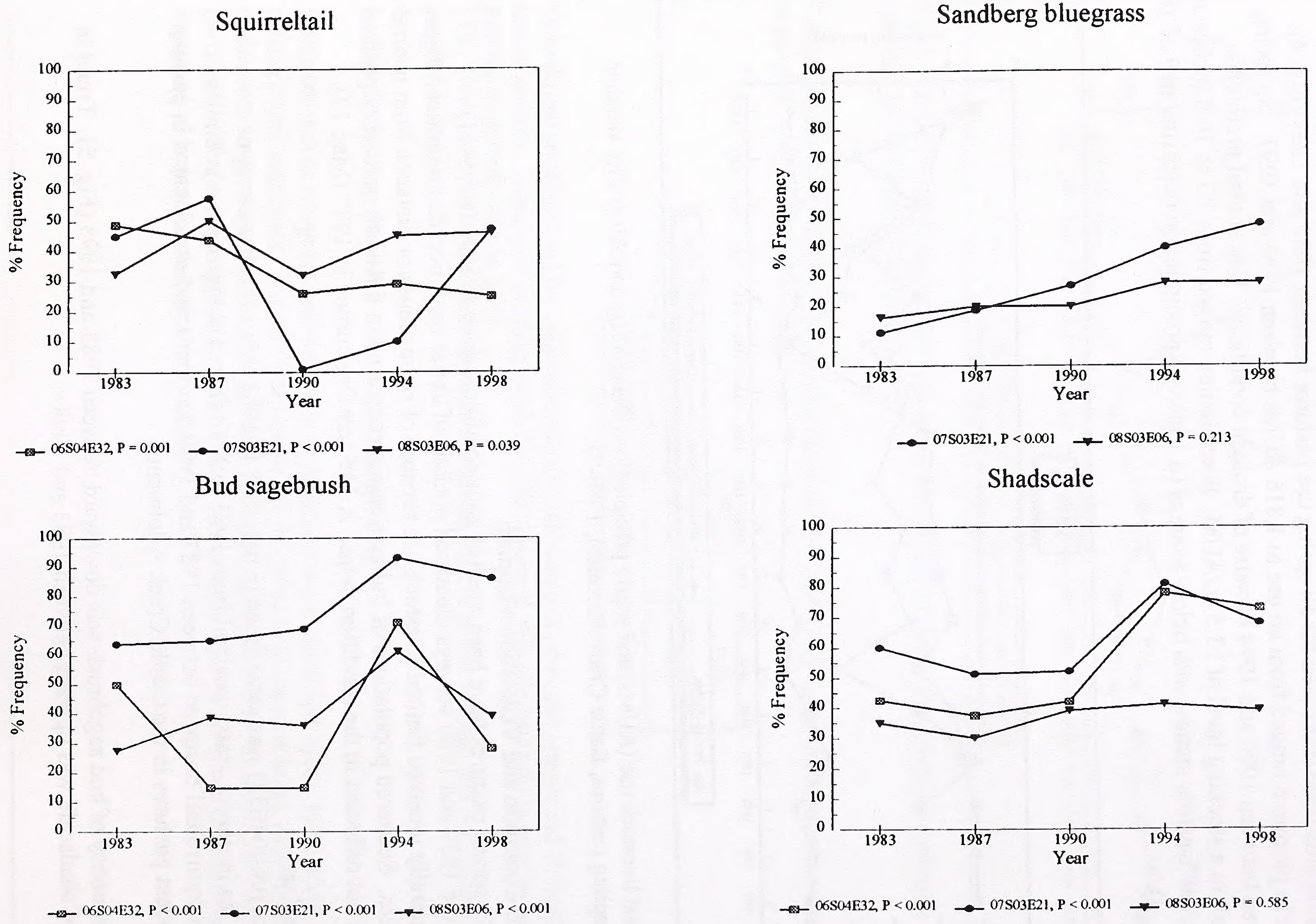


Fig. 5. Frequency of occurrence of perennial grasses and shrubs on Nested Plot Frequency Transects located in winter/early spring (06S04E32) and mid spring (07S03E21, 08S03E06) pastures, Battle Creek Allotment, 1983-98.

- Photo Plots/View Photos

The photo plot showed mortality of squirreltail between 1990-98 (Table 9). Several shrubs present in 1983 had died by 1990. Cheatgrass cover was greatest during 1983-87, minimal during 1990-94, and recovered to 1983 levels from 1995-98. Substantial recruitment of shrubs occurred in 1993 with above normal precipitation; however, most did not survive to 1998. Recruitment in squirreltail populations was still absent in 1998.

Table 9. Apparent trend in abundance (D = downward, S = static, U = upward) of perennial grasses and shrubs in photo plots and view photos, pasture 8, Battle Creek Allotment, 1983-98.

Transect	Range Site	Evaluation Period	Grasses		Shrubs	
			Plot	Photos	Plot	Photos
06S04E32	Shadscale/bud sagebrush	1983-98	D	S-D	S	S-U

- Cover Point

Percent cover averaged 0.0 ± 0.0% (mean ± 95% confidence interval) (n = 4) for decreaser grasses, 0.2 ± 0.4% (n = 4) for increaser grasses, 9.2 ± 12.9% (n = 4) for biological soil crusts, and 25.1 ± 20.4% (n = 5) for bare ground between 1983 and 1998. Trend in decreaser and increaser grass cover was static between 1983 and 1998 (Fig. 6).

Biological soil crusts decreased between 1983 and 1998 (Fig. 6). Sandy soils, the predominant soil in pasture 8, support fewer populations of biological soil crusts compared to silty or loamy soils. Bare ground cover increased in proportion to decreases in nonpersistent litter (annual grasses).

Range Improvement Projects

Seven troughs fed by 6.1 miles of pipeline were placed in pasture 8 in 1982. The pipeline was constructed to improve livestock distribution. An irrigation canal provided water to the northern portion of pasture 8 during the early 1980s. Five miles of fence was constructed in 1982 south of the Shoofly Cutoff Road, dividing the early and mid spring pastures.

Utilization/Use Pattern Mapping

Average utilization of perennial grasses during spring use was generally < 50% (Fig. 7); however, utilization exceeded 50% in some areas for Sandberg bluegrass and squirreltail in 1997. Winter use presented little problem due to the low grazing preference and plant dormancy.

Use pattern mapping was conducted during 1995-97. Average use of perennial grasses was generally slight (Map 15). Perennial grasses, primarily squirreltail, were commonly absent from the interspaces and only present within the protective canopy of shrubs. In 1995 and 1996, precipitation levels were near normal, resulting in greater cheatgrass production. Greater use occurred near water sources and in halogeton/cheatgrass dominated areas along the pipeline (Map 16).

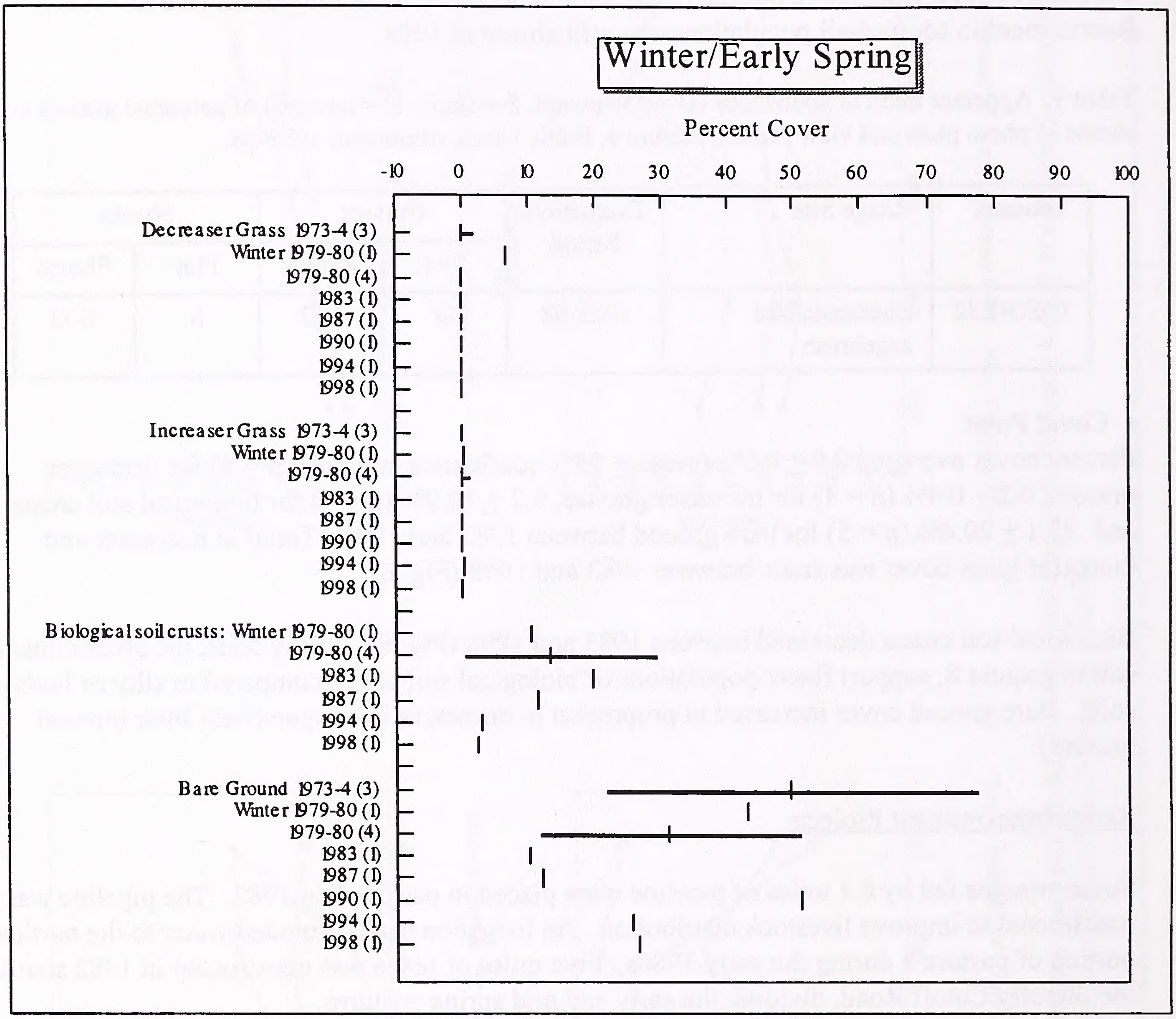


Fig. 6. Average percent ground cover (vertical bar) of decreaser and increaser grasses, biological soil crusts, and bare ground + 95% confidence interval (horizontal bar) in winter/early spring pastures, Battle Creek Allotment, 1973-98. Sample sizes are in parenthesis. Winter 1979-80 values are for pasture 8A.

Use pattern mapping in 1997 indicated heavy to severe use primarily on cheatgrass within a half mile of the pipeline. Perennial grasses in the south portion of pasture 8 had moderate to heavy livestock use up to 0.75 miles east of the pipeline. Sandberg bluegrass was the perennial species most available to livestock (within the interspaces and not under shrub canopy like squirreltail tended to be). Plants had few current year seedstalks and no residual seedstalks.

The northern third of pasture 8 consistently received the least amount of use with only occasional slight use observed on perennial species. Livestock tended to use cheatgrass in the northern portion, but estimates on the amount of use were difficult because of spring growth.

Potential Stocking Levels Based on Forage Surveys

Forage production ratings were static between 1965 and 1980 when adjustments were applied for different allocation factors (Maps 17, 18). Cheatgrass provided 44% of the total forage production at 20% allocation, and 60% at 50% allocation as limited by the MFP watershed objective. If 50% of cheatgrass production was allocated, the 1980 inventory grazing capacity for pasture 8 was 945 AUMs (14.4 ac/AUM) (Table 10).

Table 10. Potential stocking levels (AUMs) based on 1965 and 1980 forage production surveys for pasture 8 (early spring use), Battle Creek Allotment.

	1965	1980
Unadjusted[a]	681	945
Adjusted[b]	693	572

[a] Unadjusted stocking level for 1965 assumed 40% allocation of perennial grasses and 20% allocation for annual grasses. Unadjusted stocking levels for 1980 assumed 50% allocation for perennial and annual grasses, consistent with the MFP.
[b] The 1965 and 1980 figures were adjusted to allocate 50% of perennial grass and 20% of annual grass production to livestock.

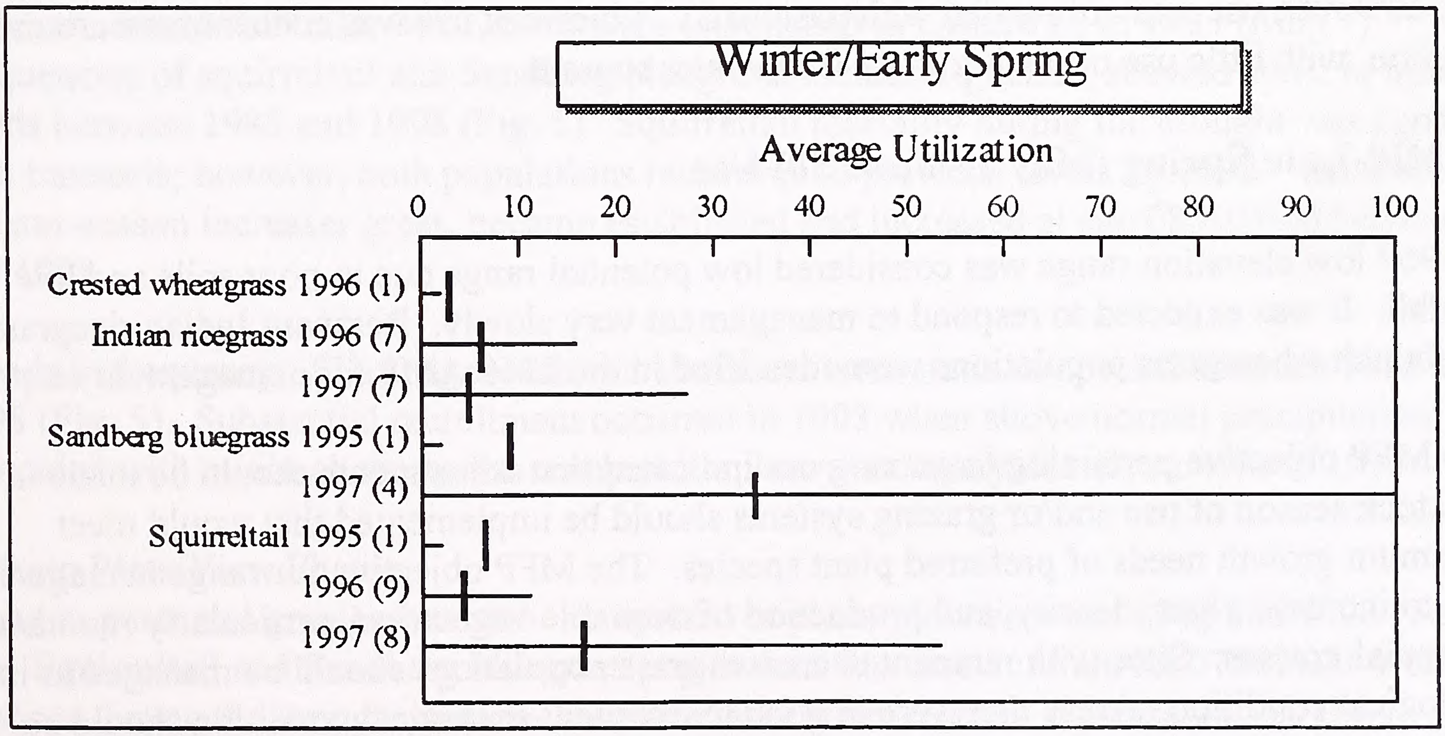


Fig. 7. Average utilization (vertical bars) of perennial grasses ± 2 standard deviations (horizontal bar) in winter/early spring pasture 8, Battle Creek Allotment, 1995-97. Number of utilization transects per mean is shown in parenthesis.

Summary

The long-term trend in ecological condition was downward, even when cyclic patterns in abundance of squirreltail were considered. Squirreltail populations declined and shrub populations were static or increasing. Use during April occurred during the critical growth period of Sandberg bluegrass and before the critical growth periods of Indian ricegrass, needle-and-threadgrass, and squirreltail. Despite several years of non-use during drought conditions, perennial grass populations did not recover. Vigor and productivity of perennial grasses was generally low, with the majority of squirreltail grasses located under shrub canopies. Mature shrubs showed less response to drought. New shrubs rather than perennial grasses occupied bare ground after the drought.

Watershed protection was inadequate during drought conditions. Perennial grasses provided minimal interspace cover. Cheatgrass cover fluctuated with precipitation levels. Where cheatgrass is the predominant species, continued use (even at reduced levels) during extended drought conditions may not maintain adequate ground cover (50%) for watershed protection. Sandy soils were vulnerable to wind and water erosion. Localized scouring of shrub interspaces occurred, resulting in pedestalled crowns of perennial grasses.

The stocking level at total preference was slightly greater than the potential stocking level, and the pasture was stocked above capacity when grazed during 1990-97. Utilization was generally <50%; however, timing of utilization studies can influence the observed utilization. Regrowth may have occurred between the time grazing use ended and utilization studies were read. Estimating the degree of regrowth and actual utilization is difficult and was not done. This could have resulted in lower recorded utilization levels. Construction of the pipeline allowed spring use; however, use was not rotated with pasture 21. Livestock use was concentrated around the pipeline, with little use occurring away from water sources.

d. Mid-Late Spring (May 1 - June 30) Use

In 1969 low elevation range was considered low potential range due to poor soils and low rainfall. It was expected to respond to management very slowly. Remnant Indian ricegrass and bluebunch wheatgrass populations were identified in the 1969 AMP for management emphasis.

The MFP objective pertaining to grazing use indicated that adjustments should be made in livestock season of use and/or grazing systems should be implemented that would meet minimum growth needs of preferred plant species. The MFP objective for range management was to increase vigor, density, and production of desirable vegetation, particularly remnant perennial grasses. Sites with remnant decreaser grass populations should be managed to improve ecological condition. Areas that were in good to excellent ecological condition should be maintained.

Actual Use/Climate

Actual use in pastures 21, 22, and 12 ranged from 1,642 to 5,072 AUMs between 1990 and 1997. Lack of available water resulted in minimal use of pasture 9. Use at total preference would result in a stocking level of 13.5 ac/AUM. Precipitation ranged from 3.7 to 10.8 inches at the Grandview weather station with below average (6.1 inches) precipitation occurring 9 of 18 years (Fig. 4).

Mid Spring (May 1 - 31) Use (Pasture 21)

Trend

- Historical Condition and Vegetation Mapping

Pasture 21 has been generally rated in poor condition since 1959 (Maps 9-11). However, the 1959 and 1980 surveys recognized pockets of better condition communities with squirreltail understories. These pockets occurred in the northwest portion of the pasture and along the southern and eastern portion of the lakebeds. Steep slopes at the southern end of the pasture received limited livestock use and supported populations of bluebunch wheatgrass.

Much of the lakebed portion of the pasture lacked a significant perennial grass understory (Map 13); however, small areas with primarily Sandberg bluegrass understories occurred in the south and east portions of pasture 21. Bluebunch wheatgrass or sand dropseed occurred primarily on steep slopes.

- NPFT Studies

Two transects (07S03E21, 08S03E06) were established in pasture 21 in 1983 (Map 7). Frequencies of squirreltail and Sandberg bluegrass, increaser grasses, showed static to upward trends between 1983 and 1998 (Fig. 5). Squirreltail mortality during the drought was apparent at both transects; however, both populations recovered to previous levels by 1998. Sand dropseed, a warm-season increaser grass, became established and increased at site 08S03E06 between 1990 and 1998.

Trends in frequency of bud sagebrush and shadscale were static to upward between 1983 and 1998 (Fig. 5). Substantial recruitment occurred in 1993 when above normal precipitation coincided with minimal cheatgrass competition; however, many did not survive to 1998.

- Photo Plots/View Photos

Trend in perennial grasses was static to upward in photo plots between 1983 and 1998 (Table 11). Squirreltail and Sandberg bluegrass populations increased at transect 07S02E21 after declines during the drought; however, squirreltail did not recover at transect 08S03E06. Sand dropseed increased at transect 08S03E06. Cheatgrass was prominent in 1987, but decreased prior to 1990, and recovered between 1995-97. Recruitment of shrub species occurred between

1990 and 1994; however, many did not survive to 1998. There was a decrease in the amount of litter present and an increase in the amount of bare ground from 1987 to 1990.

Table 11. Apparent trend in abundance (D = downward, S = static, U = upward) of perennial grasses and shrubs in photo plots and view photos, pasture 21, Battle Creek Allotment, 1983-98.

Transect	Range Site	Evaluation Period	Grasses		Shrubs	
			Plot	Photos	Plot	Photos
07S03E21	Shadscale/bud sagebrush	1983-98	U	U	S	S
08S03E06	Shadscale/bud sagebrush	1983-98	D	U	D	U

- Cover Point

Percent cover averaged 0.0 ± 0.0% (mean ± 95% C.I.) (n = 8) for decreaser grasses, 0.9 ± 0.6% (n = 8) for increaser grasses, 5.0 ± 4.7% (n = 8) for biological soil crusts, and 10.9 ± 5.5% (n = 10) for bare ground between 1983 and 1998. Trend in decreaser and increaser grass cover was static between 1973 and 1998 (Fig. 8).

Biological soil crusts were maintained between 1983 and 1998 (Fig. 8). Bare ground cover remained static overall between 1983 and 1998, but increased in proportion to decreases in nonpersistent litter (annual grasses), reflecting climatic patterns.

Range Improvement Projects

Twenty-two troughs fed by 26.1 miles of pipeline were constructed in pasture 21 between 1978 and 1985. One reservoir was built in conjunction with 1984 pipeline additions and was improved in 1988. The purposes of the pipeline were to improve livestock distribution, reduce livestock dependence on Little Jacks and Shoofly creeks as water sources, provide periodic spring rest, and change season of use from April to May thereby delaying movement of full livestock numbers into late spring pastures until June 1.

Fencing along Shoofly Creek and the west side of pasture 21 was generally completed prior to 1965. The eastern portion of the pasture was fenced in 1985 to implement the Horse Basin Decision. No fences exist between pastures 21 and 22.

Utilization/Use Pattern Mapping

Average utilization of perennial grasses was generally < 50% in the mid spring range (Fig. 9). Utilization data prior to 1983 indicated some moderate to heavy use, particularly on Indian ricegrass, Sandberg bluegrass, and squirreltail. Little use was recorded in the 1990s.
Use pattern mapping was conducted during 1994, 1995, and 1997. Average spring use in pasture 21 was slight to light on perennial grasses in areas mapped (Map 15). Spring use in 1994 began in pasture 21 (pasture 8 was rested) due to drought conditions, and was to be confined to the

southern portion of the pasture. Use was estimated at slight on available squirreltail and Sandberg bluegrass. Sand dropseed generally indicated no use, with only occasional plants receiving slight use. Cheatgrass production was low and use was estimated as slight. The degree of use encountered in 1995 basically reflected 1994 use patterns. Use on Shoofly Creek was estimated as severe along the greenline and use on squirreltail was moderate adjacent to the riparian areas.

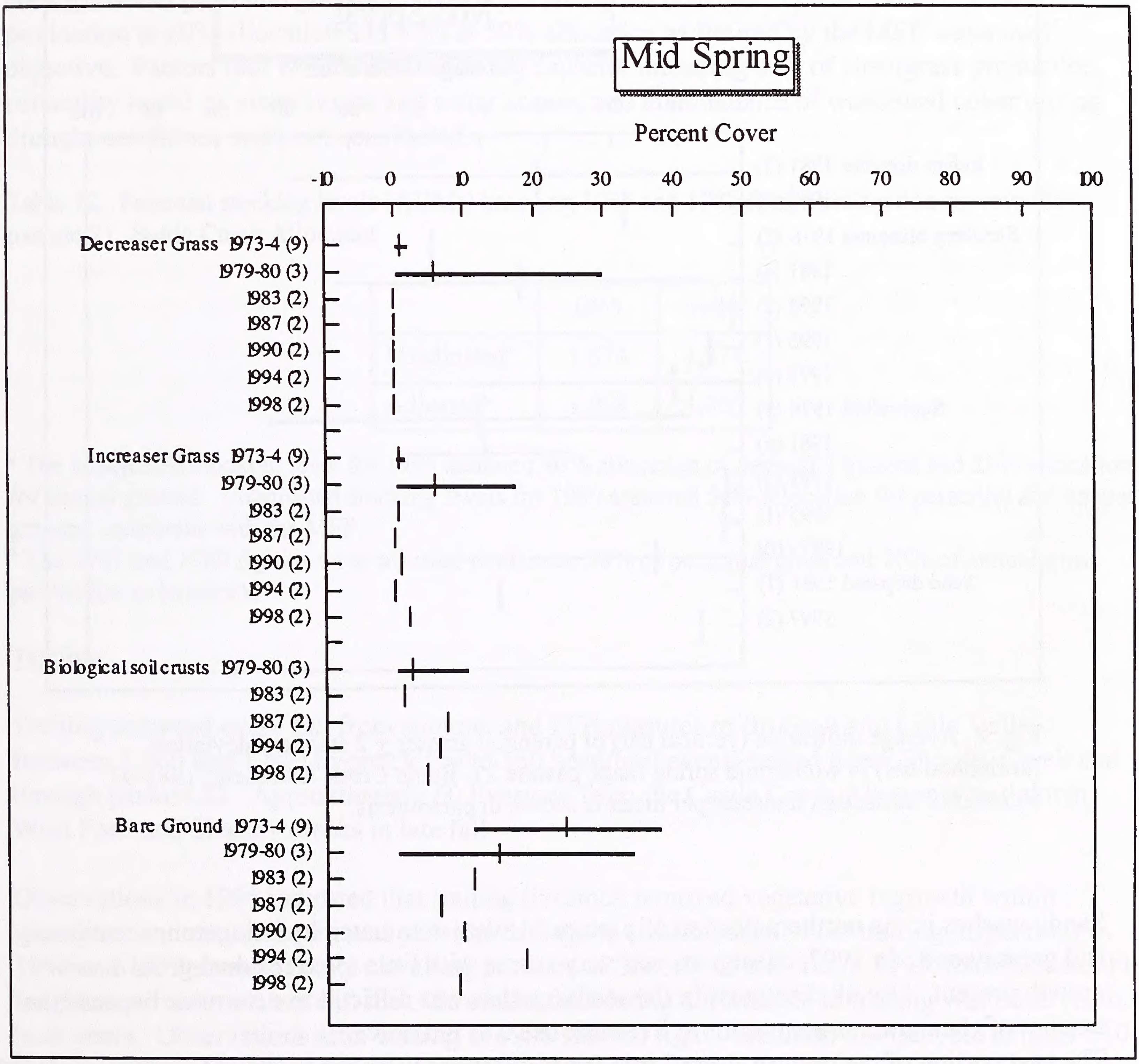


Fig. 8. Average percent ground cover (vertical bar) of decreaser and increaser grasses, biological soil crusts, and bare ground ±95% confidence interval (horizontal bar) in pasture 21, Battle Creek Allotment, 1973-98. Sample sizes in parenthesis.

Use pattern mapping in 1997 indicated the heaviest concentration of use on perennial grasses near the mouth of Perjue Canyon (Map 16). Sandberg bluegrass and squirreltail received moderate use. Cheatgrass received light use and sand dropseed received slight use. Heavy use occurred along the Shoofly Creek greenline and on Sandberg bluegrass in the lower third of slopes on the east side of the creek.

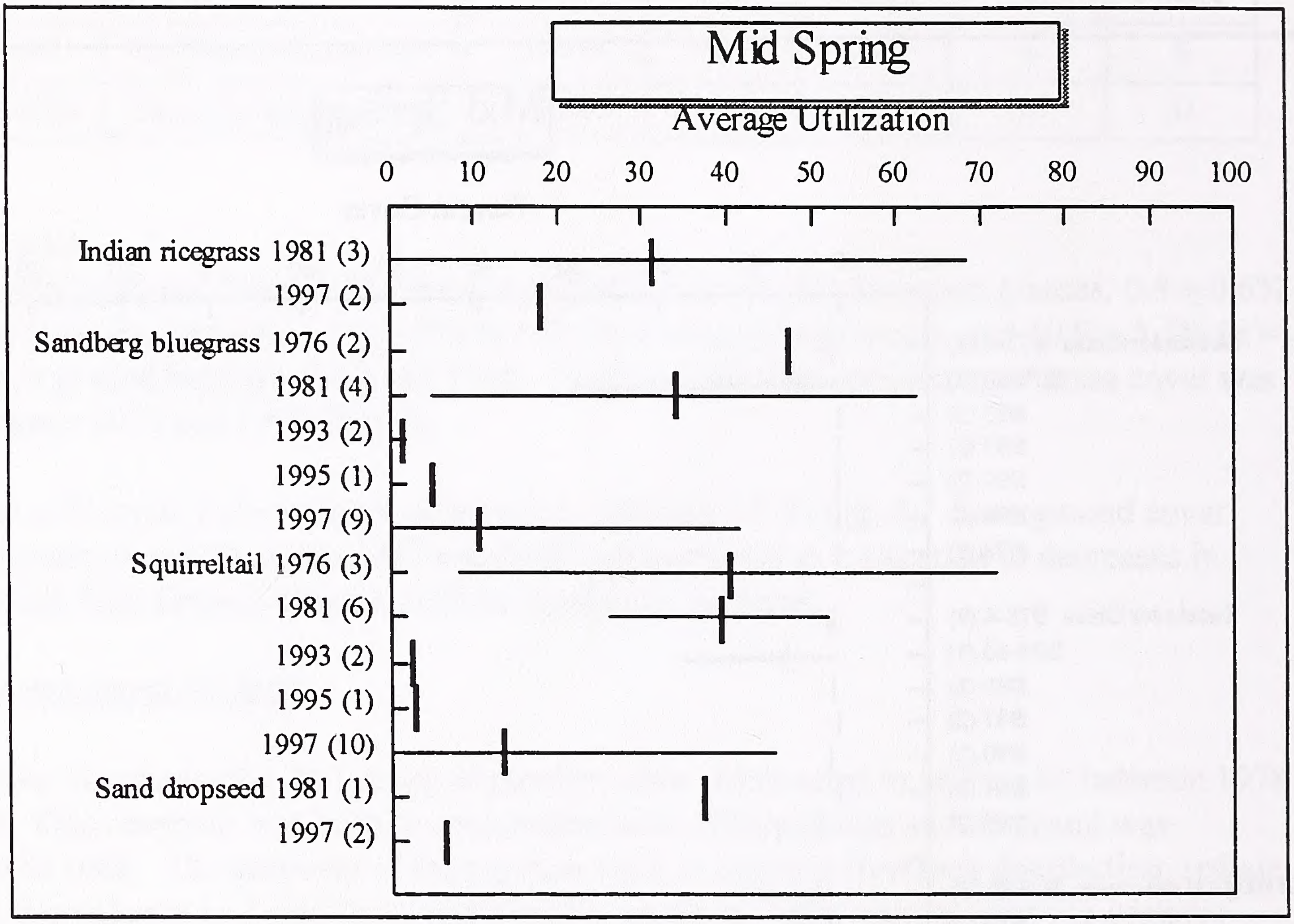


Fig. 9. Average utilization (vertical bar) of perennial grasses ± 2 standard deviation (horizontal bar) in winter/mid spring range pasture 21, Battle Creek Allotment, 1981-97. Number of utilization transects per mean is shown in parenthesis.

Sandy washes in the northern portion of pasture 21 were dominated by halogeton, cheatgrass, and greasewood. In 1997, cheatgrass was very sparse with little to no residual grass or new growth present. Use of cheatgrass in the sandy washes was difficult to determine because the amount of cheatgrass present prior to livestock use was unknown.

The east portion of the pasture along Little Jacks Creek received the least amount of use in 1997 and perennial grasses were abundant. Occasional use of Indian ricegrass, squirreltail, and Sandberg bluegrass was encountered. Perennials in this portion of the pasture were healthy and vigorous with high Sandberg bluegrass seed production.

Potential Stocking Levels Based on Forage Surveys

Forage production ratings were generally static between 1965 and 1980 when adjustments were made for different allocation factors (Maps 17, 18). Forage production was not allocated for steep slopes in 1965, but was allocated in the 1980 survey.

The 1980 inventory grazing capacity was 1,874 AUMs (17.5 ac/AUM) at 50% allocation of cheatgrass and perennial grasses (Table 12). Cheatgrass provided 33% of the total forage production at 20% allocation and 52% at 50% allocation as limited by the MFP watershed objective. Factors that would reduce grazing capacity including lack of cheatgrass production, suitability based on steep slopes and water access, and maintenance of watershed cover during drought conditions were not considered.

Table 12. Potential stocking levels (AUMs) based on 1965 and 1980 forage production surveys for pasture 21, Battle Creek Allotment.

	1965	1980
Unadjusted[a]	1,874	1,874
Adjusted[b]	1,968	1,353

[a] The unadjusted stocking level for 1965 assumed 40% allocation of perennial grasses and 20% allocation for annual grasses. Unadjusted stocking levels for 1980 assumed 50% allocation for perennial and annual grasses, consistent with the MFP.

[b] The 1965 and 1980 figures were adjusted to allocate 50% of perennial grass and 20% of annual grass production to livestock.

Trailing

Trailing occurred every fall from summer and FFR pastures to Bruneau and Little Valley. Between 1,200 and 1,600 livestock (up to 550 head/trail event) trailed down Shoofly Creek and through pasture 21. Approximately 60 livestock from the Castle Creek Allotment trail down West Fork and Shoofly creeks in late fall.

Observations in 1996 indicated that trailing livestock removed vegetative regrowth within greenlines and caused additional physical damage to stream banks. Post trailing inspections in 1996 and 1997 showed heavy use along portions of Shoofly Creek, but in 1997, four-inch stubble height requirements were still met. Streambank shearing attributable to trailing was observed in both years. Observations after trailing in 1998 showed light vegetation use (stubble heights ≥ 10 inches) and localized bank trampling at road/trail crossings.

Summary

The long-term trend in ecological condition was static. Patterns of understory dominance were similar between 1980 and 1998. Squirreltail, a short-lived species, is susceptible to cyclical die-offs caused by drought or other factors (Sharp et al. 1990). Squirreltail populations decreased at the trend site (07S03E21) in an area which received continuous grazing during the 1987-94 drought, but recovered by 1998. Squirreltail populations increased at the trend site (08S03E06) that received slight grazing use. Sandberg bluegrass populations increased at trend sites and healthy, vigorous plants were present in other portions of the pasture. Sand dropseed, which began green-up toward the end of livestock use, increased in abundance. Shrub populations also appeared to be cyclic, increasing in drought years when cheatgrass production was absent and squirreltail production decreased. Grazing occurred during the critical growth period of squirreltail, but not during the critical growth periods of Sandberg bluegrass and sand dropseed. Vigor of perennial grasses was generally good.

Watershed protection (<50% bare ground cover) was adequate except in areas where cheatgrass was the primary cover component. During drought years, cheatgrass cover was sparse without residual seedstalk carryover from previous years and growth was minimal. Continued use of cheatgrass during below-normal precipitation years did not maintain adequate ground cover in shrub interspaces for watershed protection, even with voluntary reductions in grazing use.

The stocking level at total preference was 30% greater than the potential stocking level. The difference may be even greater because fluctuating cheatgrass production and suitability limitations imposed by steep slopes were not considered in determining potential stocking levels. Average use of perennial grasses was generally < 50% during 1994, 1995, and 1997; however, moderate to heavy use occurred along Shoofly Creek and adjacent uplands. Slight to light use may also have contributed to observed trend in perennial grasses, but regrowth made determining utilization difficult. Construction of pipelines increased water availability, which improved livestock distribution and reduced use of riparian areas. Impacts of fall trailing on creeks varied from extensive (prior to 1997) to localized at stream crossings (1998).

Late Spring (June 1 - 30) Use (Pastures 9, 12, 22)

Trend

- Historical Condition Mapping

Condition ratings in late spring pastures were generally associated with steepness of slope, elevation, proximity to water, and historic uses (Maps 9-11). Steeper slopes and areas with limited water availability were rated in good to excellent condition. Small areas around ephemeral lakes and along fencelines were rated in poor condition. The southern portion of pasture 12 was rated in fair condition in 1966. Creation of pasture 14 influenced the amount of use in this area and condition improved to good by 1980. Portions along the west side of Pasture 22, an historic livestock access corridor on the West Fork Shoofly Creek, were rated in poor condition in the 1966 and 1980 inventories. New areas of poor and fair condition developed where cattle concentrated along the fenceline between pastures 14 and 22. Concentrated use during the critical growth period resulted in the reduction or loss of decreaser grasses. Inaccessible portions of pasture 22 remained in good to excellent condition.

Shallow soil sites in pasture 12 were rated in poor condition in 1980 because of a predominance of increaser grasses (Map 13). Deeper soil sites supported bluebunch wheatgrass which was probably the basis for the good condition rating in 1966. In 1980, many of these areas were rated in fair condition overall because they included complexes of increaser and decreaser communities. Seventy acres burned in pasture 12 in 1992 (Map 12).

Grass understories in late spring pastures were dominated by decreaser or a mixture of decreaser and increaser species (Map 13). Increaser grasses were the primary species in some low sagebrush communities and areas of concentrated livestock use.

- NPFT Studies

Three transects were established in late spring pastures in 1983 (Map 7). Trends in frequency of bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass were static to upward in low (08S02E29) and low/mountain big (08S02E26) sagebrush sites between 1983 and 1998 (Fig. 10). Trends in frequency of squirreltail were downward. Lupine frequency increased and longleaf phlox frequency decreased at the low sagebrush site (Fig. 11). Frequency of longleaf phlox was static at the low/mountain big sagebrush site. Frequency of low sagebrush decreased and frequency of mountain big sagebrush was static in the low sagebrush site (Fig. 11). Frequency of low sagebrush increased and frequency of mountain big sagebrush decreased at the mixed sagebrush site, which may reflect inconsistent identification.

Trends in frequency of Idaho fescue, squirreltail, and Sandberg bluegrass were upward at the mountain big sagebrush transect (08S01E29) between 1983 and 1998 (Fig. 10). Frequency of bluebunch wheatgrass declined. Trends in frequency of lupine and longleaf phlox were static to upward (Fig. 11). Frequency of mountain big sagebrush decreased and frequency of low sagebrush was static (Fig. 11).

- Photo Plots/View Photos

Trends in perennial grasses were static to upward in photo plots between 1983 and 1998 (Table 13). There was little utilization at the trend plots. Recruitment of perennial grasses occurred between 1970 and 1994. Recruitment of forbs occurred after 1987 and increased in the 1994 monitoring. Perennial grasses and forbs showed good vigor.

Trends in mountain big and low sagebrush were static (Table 13). Bitterbrush plants increased in size between 1970 and 1987 at site 08S01E33, but began experiencing a tent caterpillar infestation by 1990 resulting in defoliation, decreased vigor, and mortality.

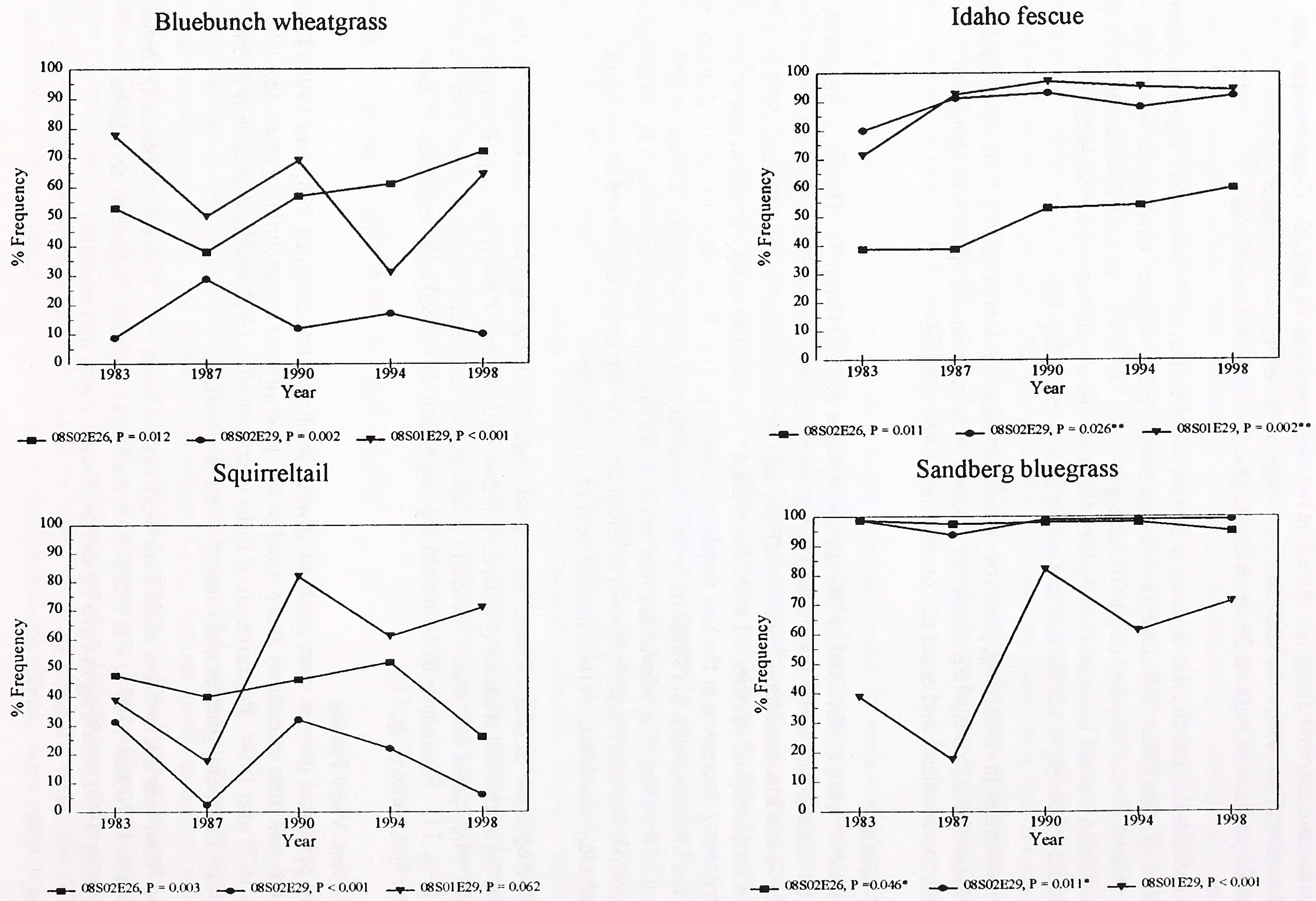


Fig. 10. Frequency of occurrence of perennial grasses on Nested Plot Frequency Transects located in late spring pastures, Battle Creek Allotment, 1983-98. Number of asterisks indicates plot size for which analysis was conducted. No asterisks indicates plot size 4.

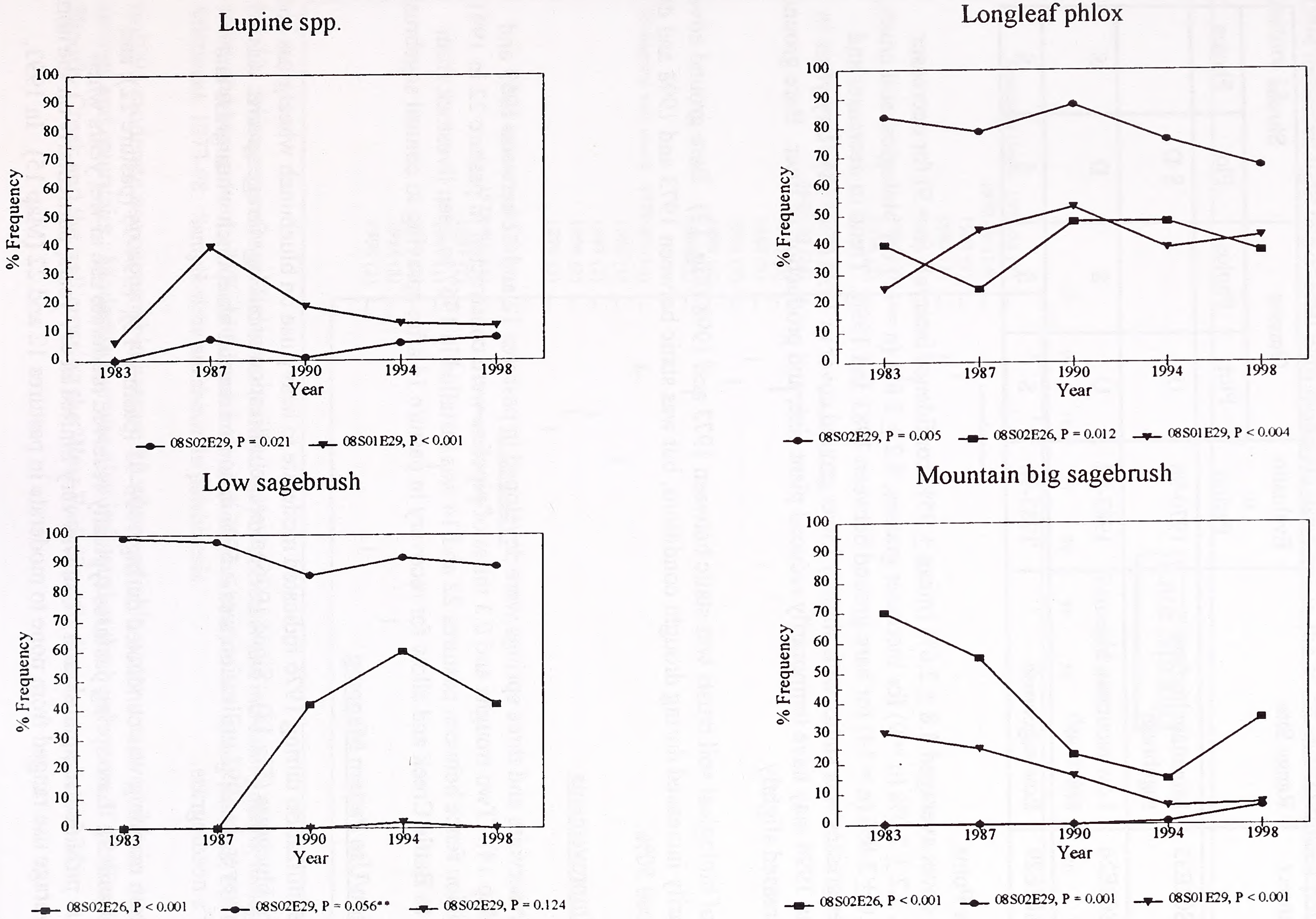


Fig. 11. Frequency of occurrence of perennial forbs and shrubs on Nested Plot Frequency Transects located in late spring pastures, Battle Creek Allotment, 1983-98. Number of asterisks indicates plot size for which analysis was conducted. No asterisks indicates plot size 4.

Table 13. Apparent trend in abundance (D = downward, S = static, U = upward) of perennial grasses and shrubs in photo plots and view photos, late spring pastures, Battle Creek Allotment, 1983-98.

Transect	Range Site	Evaluation Period	Grasses		Shrubs	
			Plot	Photos	Plot	Photos
08S01E33	Mountain big/low sagebrush	1970-98	U		S-D	
08S02E26	Low/mountain big sagebrush	1983-98	U	S	D	S
08S02E29	Low sagebrush	1983-98	S	S	S	S

- Cover Point

Percent cover averaged 3.8 ± 2.0% (mean ± 95% confidence interval) (n = 9) for decreaser grasses, 3.2 ± 2.0% (n = 9) for increaser grasses, 8.2 ± 3.8% (n = 11) for biological soil crusts, and 29.0 ± 3.8% (n = 14) for bare ground between 1983 and 1998. Trend in decreaser and increaser grasses was static, with slightly lower ground cover in 1994 (Fig. 12). Dry years in 1992 and 1994 may have temporarily reduced plant size, and production of litter. Bare ground also increased slightly.

Cover of biological soil crusts was static between 1973 and 1998 (Fig. 12). Bare ground cover temporarily increased during drought conditions, but was static between 1973 and 1998 and did not exceed 50%.

Range Improvements

Eleven reservoirs and three springs were developed in pastures 12 and 22 between 1953 and 1967 (Map 14). Two troughs and 0.3 miles of pipeline were constructed in pasture 22 in 1991. The division fence between pastures 22 and 14 was installed in 1967 to keep livestock from drifting to Battle Creek and allow for recovery in pasture 14 after spraying to control sagebrush.

Utilization/Use Pattern Mapping

Average utilization during 1976 indicated moderate to heavy use on bluebunch wheatgrass and Sandberg bluegrass (Fig 13). Since 1976, average utilization on all key forage species was < 50%; however, in 1993 utilization was > 50% in some areas on bluebunch wheatgrass and Thurber's needlegrass.

Use pattern mapping was conducted during 1993-95 (pasture 12), 1994-95 (pasture 22), and 1995 (pasture 9). Late spring pastures typically received moderate use in wet years when reservoirs provided adequate water. Use was very limited in dry years, particularly on the north end. Average use ranged from none to moderate in pastures 12 and 22 (Map 15). In 1993, pasture 12 received moderate use in the northern and southwestern portions. Distribution was poor throughout the pasture with livestock congregating near water. Use pattern mapping in 1994 indicated light use overall with moderate use areas in the north and southwest portions of pasture 12.

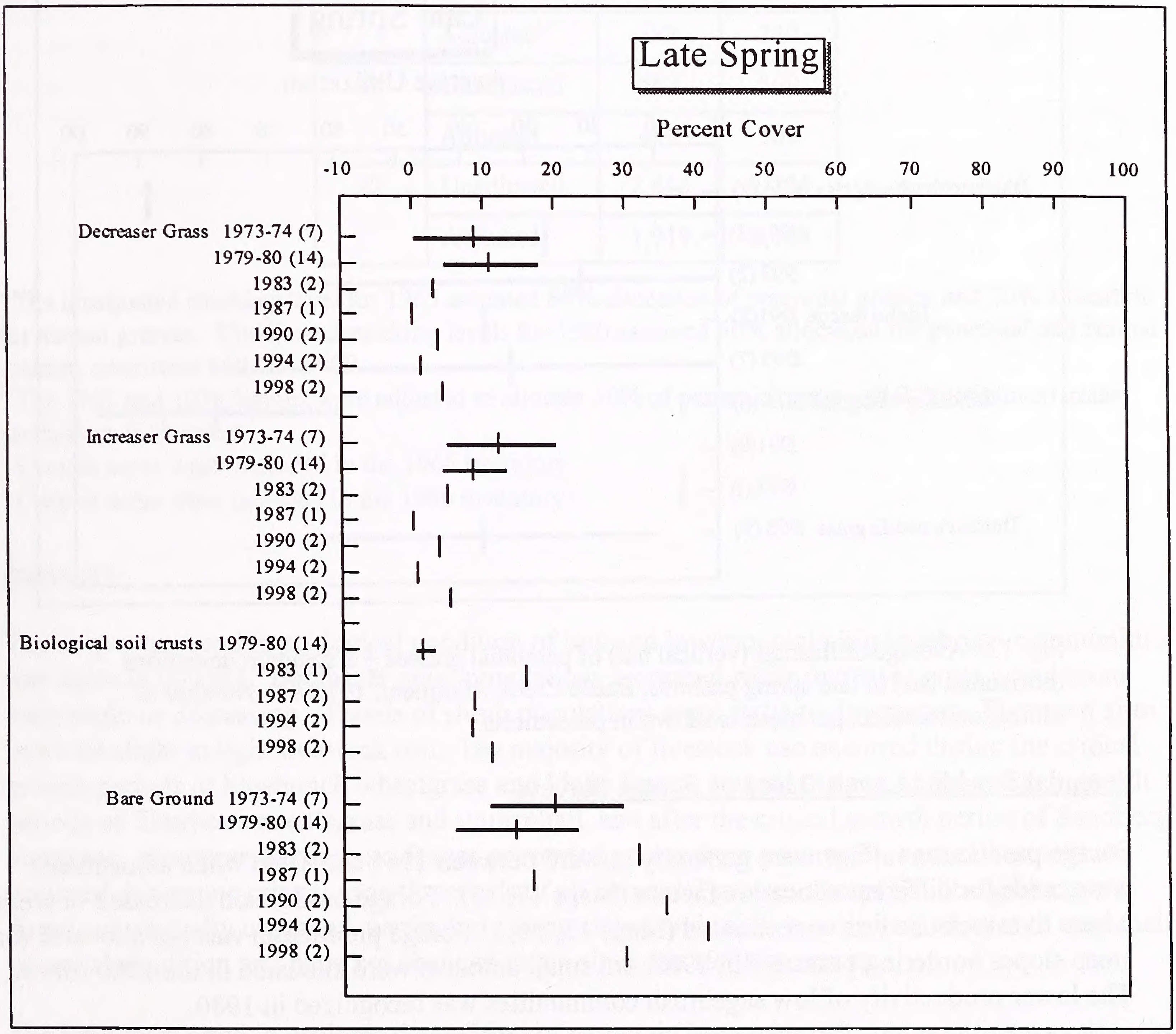


Fig. 12. Average percent ground cover (vertical bar) of decreaser and increaser grasses, biological soil crusts, and bare ground ±95% confidence interval (horizontal bar) in late spring pastures, Battle Creek Allotment, 1973-98. Sample sizes are shown in parenthesis.

In 1995 moderate use occurred in pasture 22 where reliable water was available in developed springs and reservoirs. Moderate use was also indicated at the headwaters of the East Fork Shoofly Creek and the trail crossing the West Fork Shoofly Creek into pasture 12.

Use along the fenceline was heavy to severe where livestock entered pasture 14 at the north gate and where livestock traveled south along the fenceline to OX Lake and OX Prong (Map 16). The water gap for pasture 22 on OX Prong consistently received heavy to severe use.

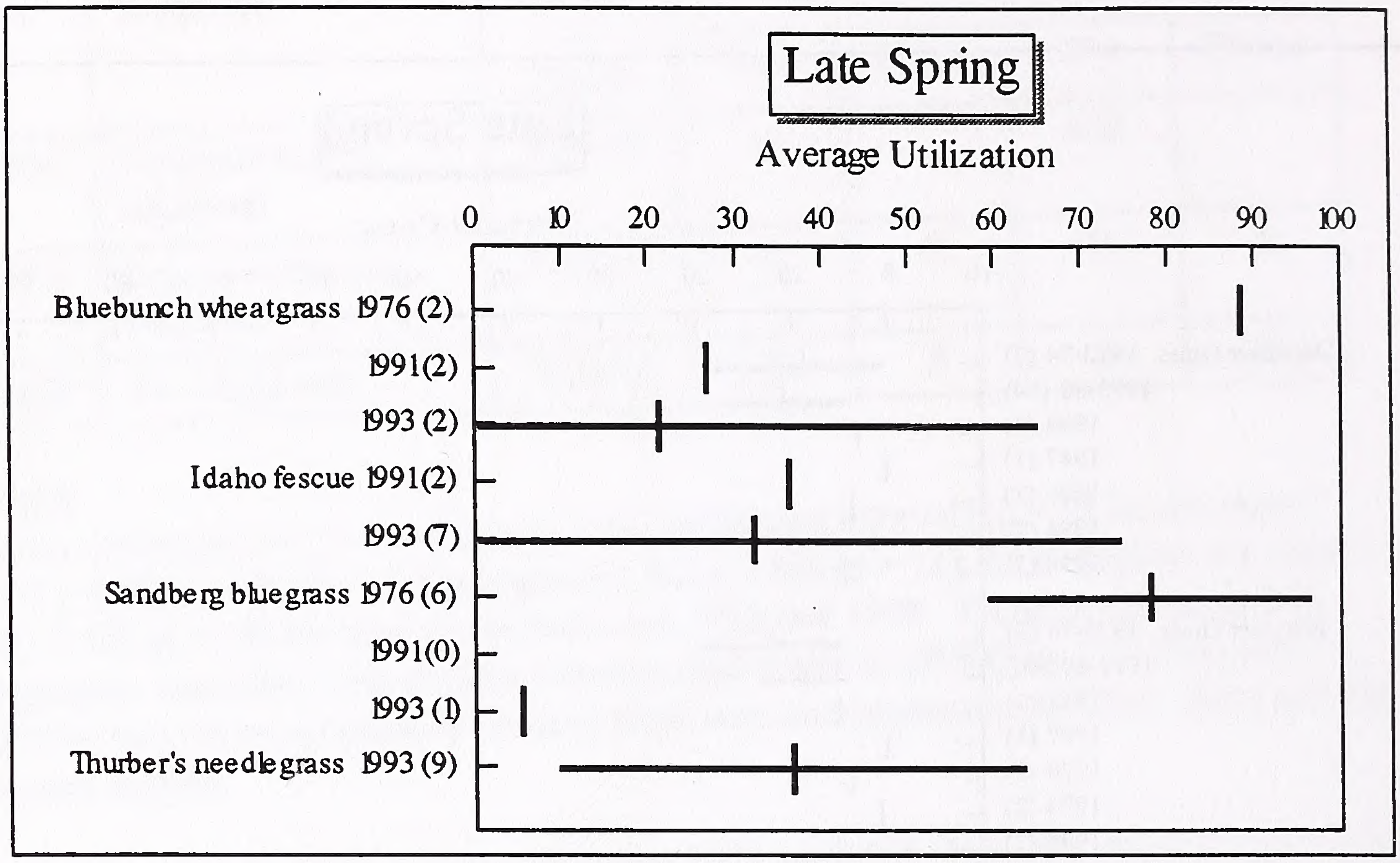


Fig. 13. Average utilization (vertical bar) of perennial grasses ± 2 standard deviations (horizontal bar) in late spring pastures, Battle Creek Allotment, 1976-93. Number of utilization transects per mean is shown in parenthesis.

Potential Stocking Levels Based on Forage Surveys

Forage production ratings were generally upward between 1965 and 1980 when adjustments were made for different allocation factors (Maps 17, 18). Forage production decreased in areas where livestock use was concentrated (Maps 15, 16). Forage production was not allocated for steep slopes bordering pasture 9 in 1965, but small amounts were allocated in the 1980 survey. The lower productivity of low sagebrush communities was recognized in 1980.

The 1980 inventory grazing capacity, excluding canyons, was 290 AUMs (7.5 ac/AUM) for pasture 9, 569 AUMs (8.3 ac/AUM) for pasture 12, and 2,224 AUMs (10.7 ac/AUM) for pasture 22 at 50% allocation of cheatgrass and perennial grasses (Table 14). Cheatgrass provided 6%, 3%, and 5% of the total forage at 50% allocation for pastures 9, 12, and 22 respectively.

Table 14. Potential stocking levels (AUMs) based on 1965 and 1980 forage production surveys for late spring pastures, Battle Creek Allotment.

Pasture		1965[c]	1980[d]
9	Unadjusted[a]	231	290
	Adjusted[b]	182	280
12	Unadjusted	562	569
	Adjusted	440	569
22	Unadjusted	2,443	2,224
	Adjusted	1,919	2,168

[a] The unadjusted stocking level for 1965 assumed 60% allocation of perennial grasses and 20% allocation for annual grasses. Unadjusted stocking levels for 1980 assumed 50% allocation for perennial and annual grasses, consistent with the MFP.
[b] The 1965 and 1980 figures were adjusted to allocate 50% of perennial grass and 20% of annual grass production to livestock.
[c] Canyon acres were excluded in the 1965 inventory.
[d] Canyon acres were included in the 1980 inventory.

Summary

The long-term trend in ecological condition of low and low/mountain big sagebrush communities was static to upward. Decreaser grass populations increased while increaser grass populations were static or decreasing. Trends of shrub populations were static to downward. The trend sites received slight to light livestock use. The majority of livestock use occurred during the critical growth periods of bluebunch wheatgrass and Idaho fescue, toward the end of the critical growth periods of Thurber's needlegrass and squirreltail, and after the critical growth period of Sandberg bluegrass. However, because no fences prevented access from pasture 21, some livestock use occurred during the critical growth periods of all perennial grasses except Sandberg bluegrass. Areas substantially ungrazed, particularly steep slopes and shallow soil sites, were at or near their potential condition and have not changed much since the 1980 inventory.

The long-term trend in ecological condition of mountain big sagebrush communities was static to upward. Perennial grass populations, with the exception of bluebunch wheatgrass, were static or increasing. Declines in bluebunch wheatgrass may have been caused by selective grazing by livestock or difficulty in distinguishing bluebunch from squirreltail at some NPFT sites. Livestock use potentially occurred during the critical growth period of all perennial grass species except Sandberg bluegrass. Mountain big sagebrush communities generally received greater livestock use than low sagebrush communities.

Watershed cover was more stable than in the early and mid spring pastures. Cheatgrass was a minor component of watershed stability. Shrub interspaces were stabilized by perennial grasses instead of gravel, rock, or cheatgrass.

The stocking level at total preference was 26% less than the potential stocking level. The difference may actually be less because steep slopes and water availability were not considered in determining potential stocking levels. Use pattern mapping and utilization indicated that portions of pasture 22 consistently received moderate utilization. The West Fork Shoofly Creek crossing between pastures 22 and 12 and portions of the boundary between pastures 22 and 14 received heavy use. The duration and amount of use in these pastures was reduced since the construction of the pipeline in pastures 8 and 21. Steep slopes and areas lacking water had limited suitability for cattle grazing. Consequently, use was concentrated in small portions of these pastures.

e. Late Spring/Summer (June 1 - September 30) Use (Pastures 10, 15)

The MFP range condition objective indicated that areas currently in poor and fair condition should be improved to fair and good condition respectively within a 20-year period. Areas that were in good and excellent condition should be maintained. Following the 20-year period, the goal would be to improve areas in fair condition to good. The objective pertaining to grazing use indicated that adjustments should be made in livestock season-of-use and/or a grazing system should be implemented to meet the minimum growth needs of preferred plant species.

In 1996 BLM implemented four inch stubble height requirements on herbaceous vegetation along creeks identified in the 1983 MFP for fisheries habitat improvement. OX Prong and Little Jacks Creek were identified for improvement.

Actual Use/Climate

Actual use in pastures 10 and 15 ranged from 1,006 to 1,699 AUMs between 1980 and 1997 (Fig. 14). Use at total preference would result in a stocking level of 14.6 ac/AUM. Precipitation ranged from 11.8 to 33.1 inches at the Silver City weather station with below average precipitation (23 inches) occurring in 7 of 16 years (Fig. 14). The Horse Basin Decision shifted the Horse Basin pasture and 380 AUMs from the Battle Creek Allotment to the Horse Basin and Sugarloaf pastures of the Northwest Allotment. Use in the Northwest Allotment was permitted between April 1 and May 31.

Trend

- Historic Condition Mapping

Pastures 10 and 15 were rated in good condition in 1959 (Map 9). The southern half of pasture 10 and all of pasture 15 were rated in fair condition in 1966 because of historic livestock concentrations occurring in mid and late spring (Map 10). The northern half of pasture 10, including Little Jacks Creek (along the present WSA boundary), lacked water and was rated in excellent condition. Turnout was delayed until after June 1, particularly after implementation of the Horse Basin Decision.

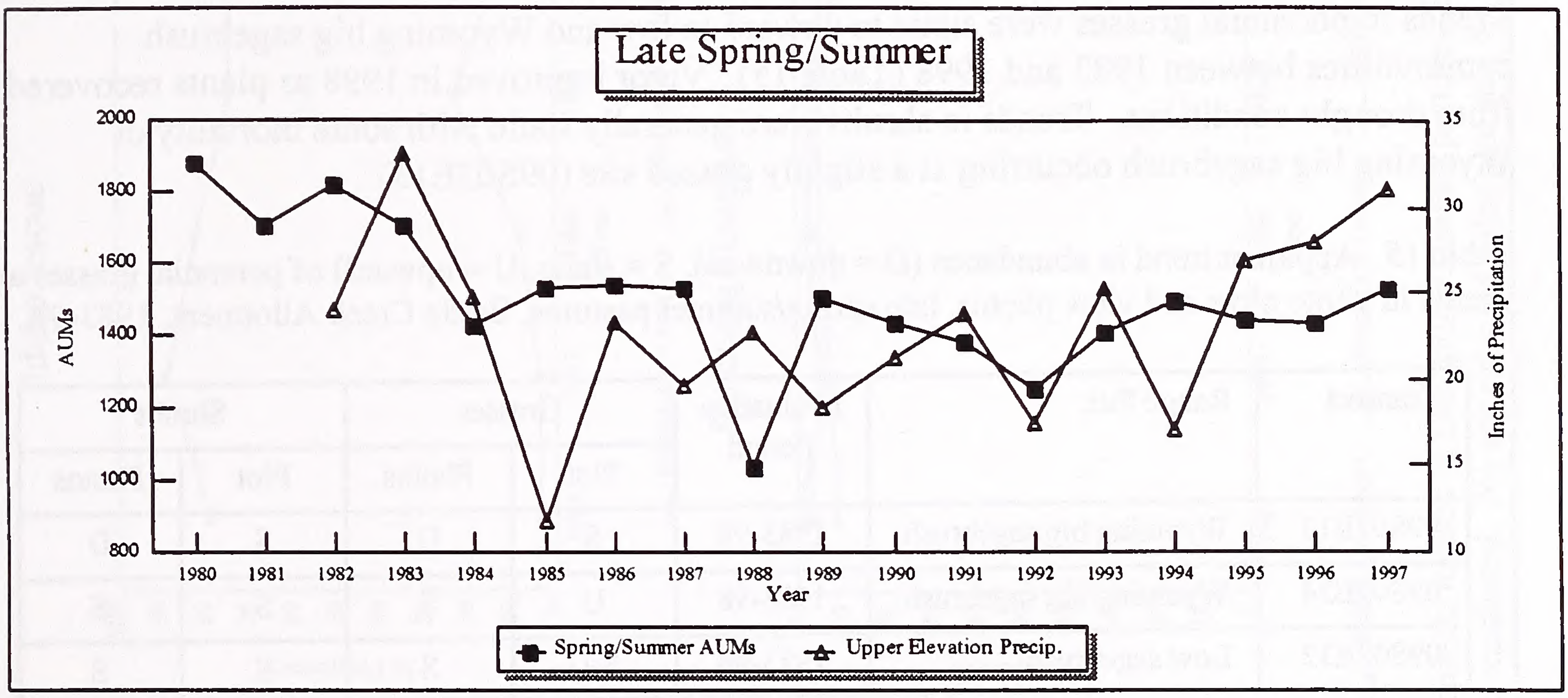


Fig. 14. Actual livestock use (AUMs) and yearly precipitation (Silver City weather station) in late spring/summer pastures, Battle Creek Allotment, 1980-97.

In 1980, mountain big sagebrush communities bordering Little Jacks Creek were rated in poor condition, while the area bordering Battle Creek remained in fair condition (Map 11). Soil depth influenced the condition rating of low sagebrush communities. Shallow soil sites with increaser grasses were rated in poor condition, while complexes of deeper soil sites with decreasers and increasers were rated in fair or good condition. A 560 acre fire burned in pasture 10 in 1985 (Map 12).

The central portion of pasture 10 and the western portion of pasture 15 had predominantly decreaser grass understories in 1980 (Map 13). Increaser grasses dominated understories in areas adjacent to water sources (OX Prong, Little Jacks, and Rattlesnake creeks).

- NPFT

Three transects were established in late spring/summer pastures in 1983 (Map 7). Trends in frequency of Idaho fescue, squirreltail, Sandberg bluegrass, and longleaf phlox were static at the low sagebrush site (09S02E32) (Figs. 15, 16). Trend in frequency of low sagebrush was slightly downward (Fig. 16).

Trends in frequency of bluebunch wheatgrass, Thurber's needlegrass, and Wyoming big sagebrush were static in Wyoming big sagebrush communities (09S02E13, 09S02E24) between

1983 and 1998 (Figs. 15, 16). Frequency of Idaho fescue increased slightly between 1983 and 1998. Trends in frequency of squirreltail and Sandberg bluegrass were static to slightly downward between 1983 and 1998 (Fig. 16).

- Photo Plots/View Photos

Trends in perennial grasses were static to upward in low and Wyoming big sagebrush communities between 1983 and 1998 (Table 15). Vigor improved in 1998 as plants recovered from drought conditions. Trends in shrubs were generally static with some mortality of Wyoming big sagebrush occurring at a slightly grazed site (09S02E13).

Table 15. Apparent trend in abundance (D = downward, S = static, U = upward) of perennial grasses and shrubs in photo plots and view photos, late spring/summer pastures, Battle Creek Allotment, 1983-98.

Transect	Range Site	Evaluation Period	Grasses		Shrubs	
			Plot	Photos	Plot	Photos
09S02E13	Wyoming big sagebrush	1983-98	S	U	S	D
09S02E24	Wyoming big sagebrush	1983-98	U	S	S	S
09S02E32	Low sagebrush	1983-98	S-U	S	S	S

- Cover Point

Percent cover averaged 4.6 ± 1.4% (mean ± 95% confidence interval) (n = 15) for decreaser grasses, 4.2 ± 1.0% (n = 15) for increaser grasses, 6.4 ± 2.2% (n = 12) for biological soil crusts, and 25.3 ± 6.6% (n = 15) for bare ground between 1983 and 1998. Cover data indicated a static trend overall in decreaser and increaser grass cover from 1973 to 1998 (Fig. 17). Biological soil crusts were maintained between 1983 and 1998 (Fig. 17). Bare ground increased slightly during the drought, but was not influenced by cattle consumption of non-persistent litter.

Range Improvements

Two reservoirs and two springs were developed between 1967 and 1982. From 1985-87, livestock were excluded from 560 acres in pasture 10 to allow recovery from a wildfire. An ineffective boundary fence was replaced in 1989 on the east side of pasture 10, the boundary of Battle Creek and Northwest allotments. Gap fences were constructed in Rattlesnake Creek and OX Prong for watering livestock in pastures 10 and 15, respectively.

Utilization/Use Pattern Mapping

Average utilization of perennial grasses was generally < 50% (Fig. 18). However, utilization of squirreltail and Idaho fescue was > 50% in 1992 in areas near Little Jacks Creek.

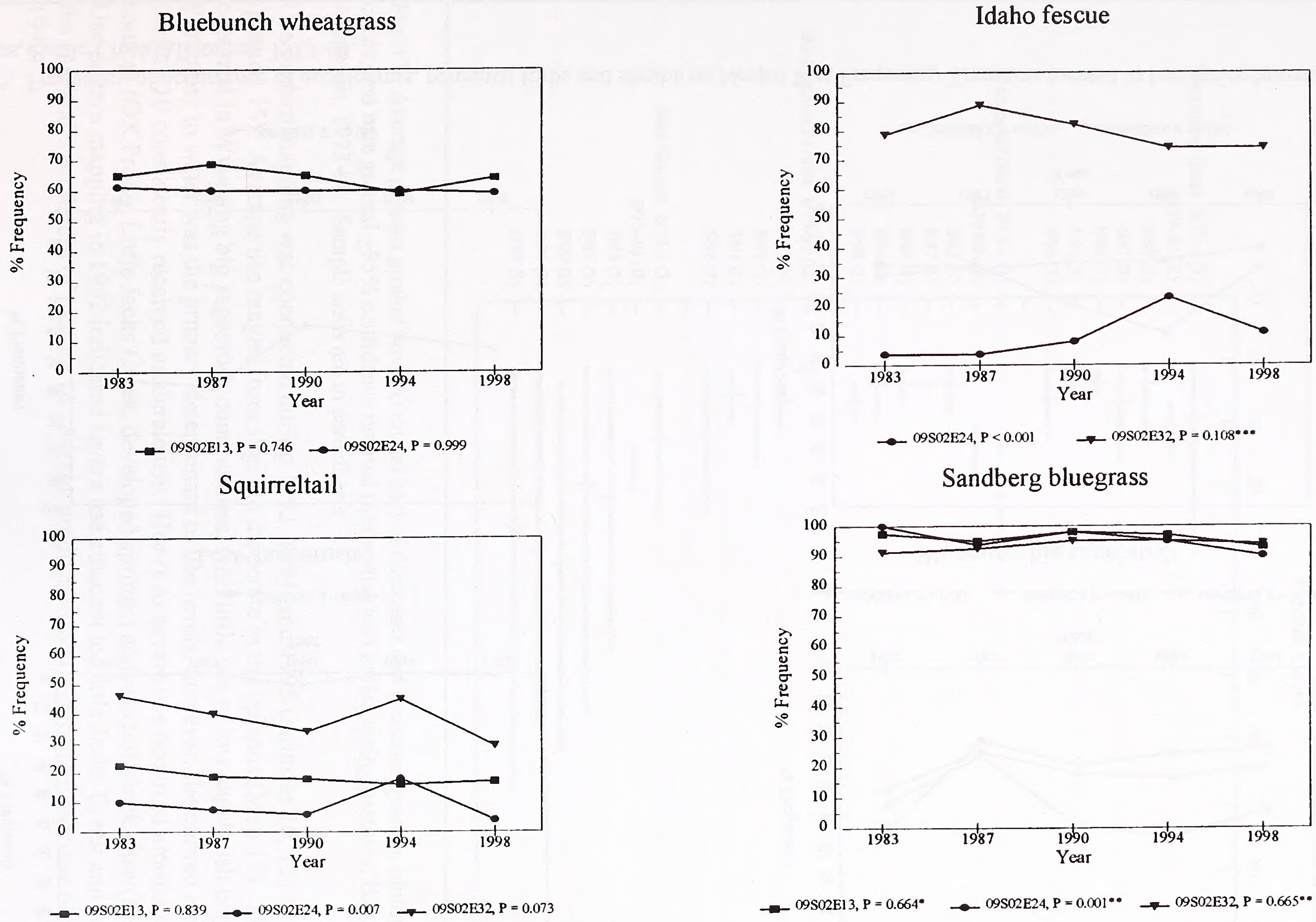


Fig. 15. Frequency of occurrence of perennial grasses on Nested Plot Frequency Transects located in late spring/summer pastures, Battle Creek Allotment, 1983-98. Number of asterisks indicates plot size for which analysis were conducted. No asterisks indicates plot size 4.

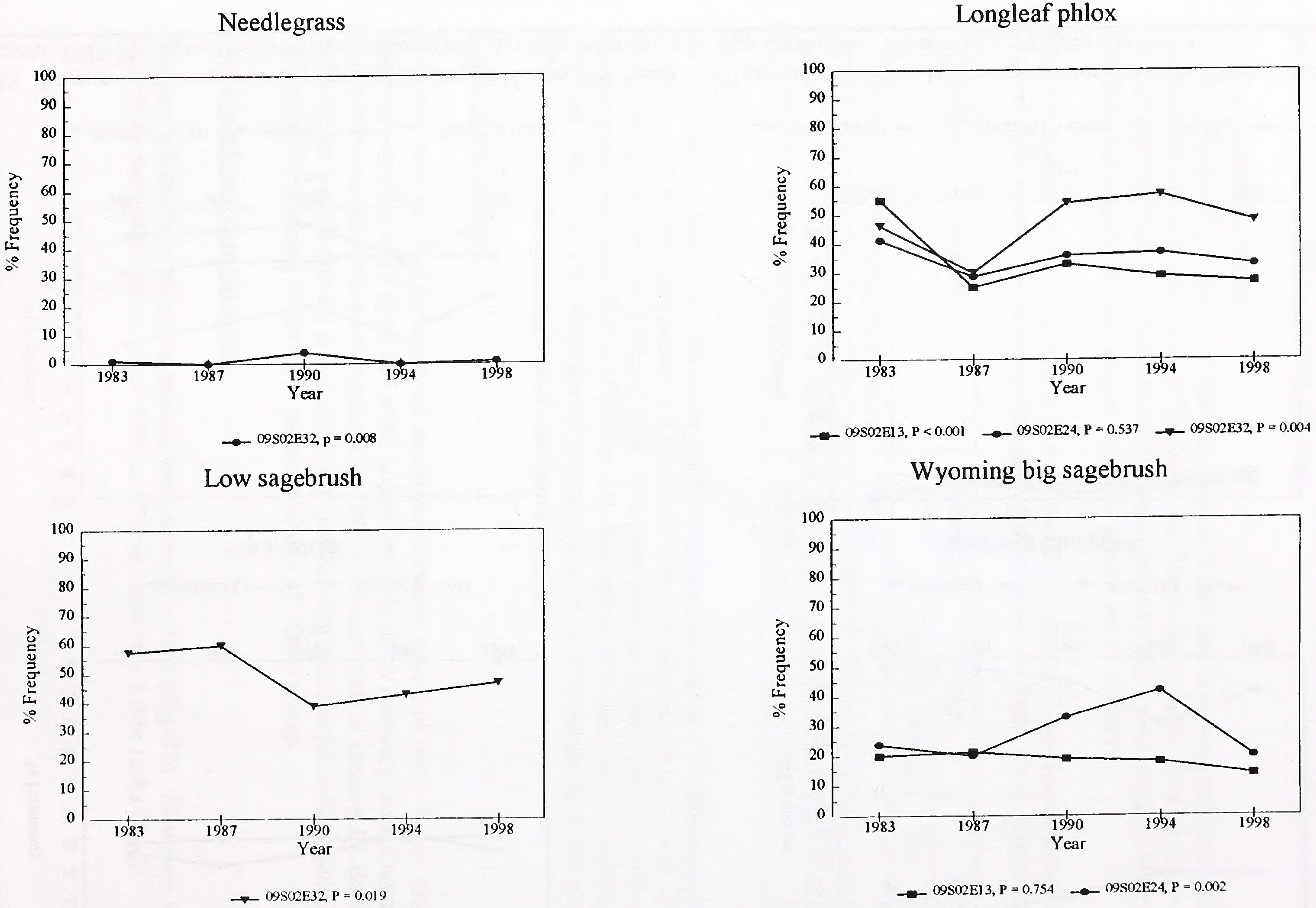


Fig. 16. Frequency of occurrence of needlegrass, perennial forbs and shrubs on Nested Plot Frequency Transects located in late spring/summer pastures, Battle Creek Allotment, 1983-98.

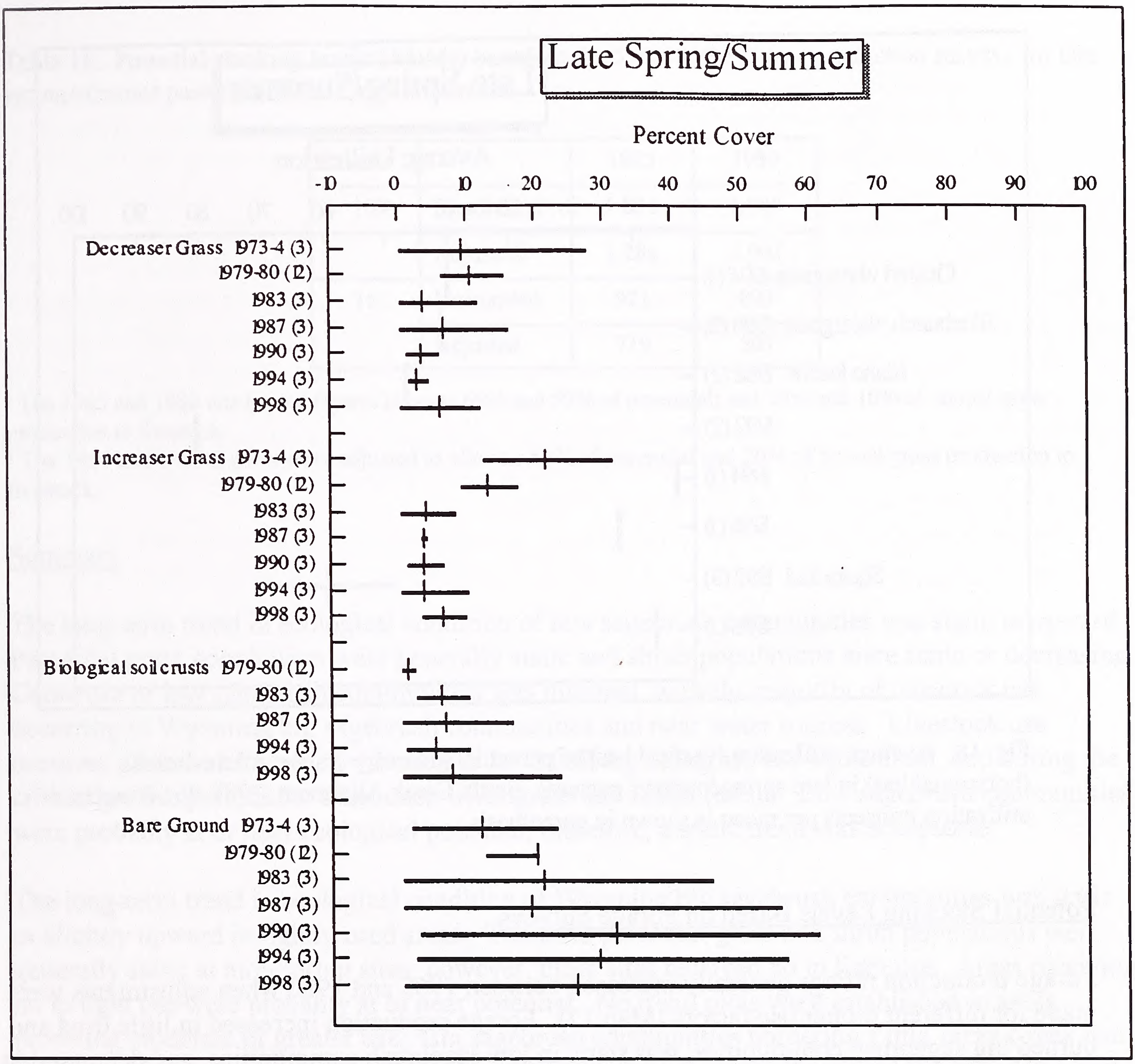


Fig. 17. Average percent ground cover (vertical bar) of decreaser and increaser grasses, biological soil crusts, and bare ground ±95% confidence interval (horizontal bar) in late spring pastures, Battle Creek Allotment, 1973-98. Sample sizes are in parenthesis.

Use pattern mapping was conducted during 1992, 1994, and 1995 (pastures 10, 15) and 1996 (pasture 15). Average use ranged from slight to moderate in the uplands (Map 15). Most use occurred in Wyoming big sagebrush communities, with little use of low sagebrush communities. Proximity to water was the primary determinant of use levels; however, the burned area in pasture 10 consistently received moderate use. Heavy to severe use occurred around water sources (OX Prong, Little Jacks Creek, developed springs) and mineral block sites (Map 16). Use pattern mapping in 1992 indicated severe use adjacent to Little Jacks Creek and south along the east and west fences of pasture 16. Forage production was reduced by extreme drought in 1992.

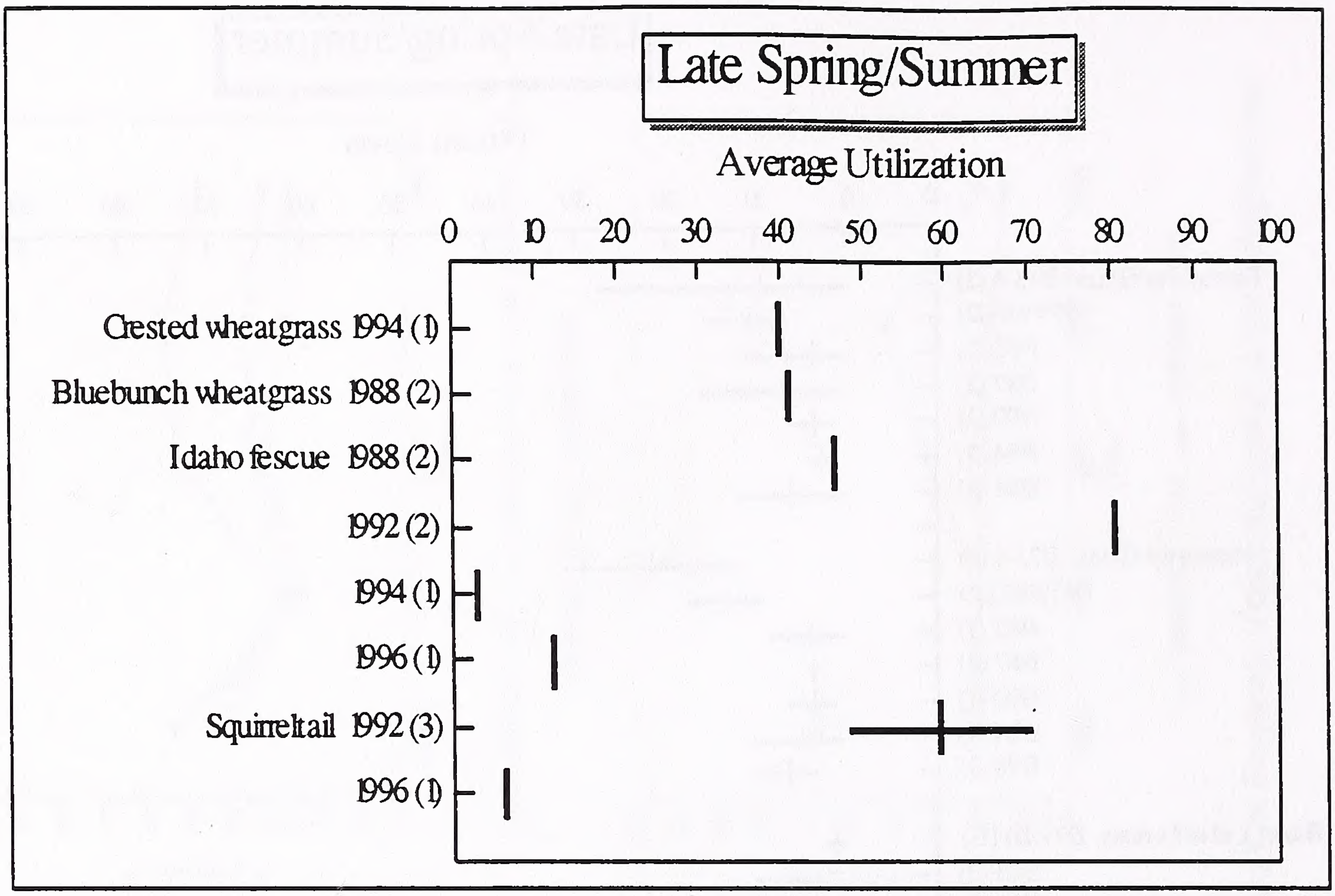


Fig. 18. Average utilization (vertical bar) of perennial grasses ± 2 standard deviations (horizontal bar) in late spring/summer pastures, Battle Creek Allotment, 1988-96. Number of utilization transects per mean is shown in parenthesis.

Potential Stocking Levels Based on Forage Surveys

Forage production ratings generally increased between 1965 and 1980 when adjustments were made for different proper use factors (Map 17). Forage production increased in little used and burned big sagebrush communities, was static in low sagebrush communities, and decreased in heavily used big sagebrush communities.

In 1980, grazing capacities were 1,905 (5.9 ac/AUM) and 807 (9.0 ac/AUM) AUMs, for pastures 10 and 15, respectively (Table 16). Limitations in potential stocking levels caused by lack of water and livestock avoidance of low sagebrush communities were not considered.

Table 16. Potential stocking levels (AUMs) based on 1965 and 1980 forage production surveys for late spring/summer pastures, Battle Creek Allotment.

Pasture		1965	1980
10	Unadjusted[a]	1.636	1,905
	Adjusted[b]	1,284	1,903
15	Unadjusted	921	807
	Adjusted	719	807

[a] The 1965 and 1980 unadjusted figures allocate 60% and 50% of perennial; and 20% and 10% of annual grass production to livestock.

[b] The 1965 and 1980 figures were adjusted to allocate 50% of perennial and 20% of annual grass production to livestock.

Summary

The long-term trend in ecological condition of low sagebrush communities was static to upward. Perennial grass populations were generally static and shrub populations were static or decreasing. Cattle use of low sagebrush communities was minimal, with the majority of livestock use occurring in Wyoming big sagebrush communities and near water sources. Livestock use occurred after the critical growth periods for Sandberg bluegrass and squirreltail, and during the critical growth periods for bluebunch wheatgrass and Idaho fescue. Low sagebrush communities were probably at or near ecological potential, therefore, a static trend was acceptable.

The long-term trend in ecological condition of Wyoming big sagebrush communities was static or slightly upward in lightly used areas. Trends in perennial grass and shrub populations were generally static at monitoring sites; however, these sites received no to light use. Areas receiving no to light use were probably at or near potential. No trend plots were established in areas receiving moderate or greater use. Big sagebrush communities bordering Little Jacks Creek had little decreaser grass cover. Ecological condition and productivity decreased between 1965 and 1980 in areas receiving moderate use. These areas probably remained below ecological potential.

The watershed objective was probably met in both low and Wyoming big sagebrush communities. However, the status of watershed protection in heavily grazed areas was unknown. Perennial grasses dominated shrub interspaces and were the primary source of watershed cover. In greater precipitation areas, biological soil crusts were relatively unimportant as watershed cover.

The stocking level at total preference was 53% less than the potential stocking level. The actual difference may be less because lack of water and livestock avoidance of low sagebrush communities were not considered. Under current grazing management, livestock graze riparian areas and have unrestricted access between pastures 10 and 15 from June 1 to September 30. Use pattern mapping consistently indicated problems with heavy to severe use of riparian areas. Livestock distribution was poor, with livestock congregating along creeks and around the two developed springs in pasture 10.

f. Summer (July 1 - September 30) and FFR (July 1 - October 15) Use

The MFP range condition objective indicated that areas currently in poor and fair condition should be improved to fair and good condition respectively within a 20-year period. Areas that were in good and excellent condition should be maintained. Following the 20-year period, the goal would be to improve areas in fair condition to good. The objective pertaining to grazing use indicated that adjustments should be made in livestock season-of-use and/or implementation of a grazing system which meet the minimum growth needs of preferred plant species.

Summer Pastures 14, 20, 18 (FFR), and 19 (FFR)

Actual Use/Climate

Actual use for summer grazing in pastures 14 and 20 ranged from 2,119 to 5,979 AUMs between 1980 and 1997 (Fig. 19). Use at total preference would result in a stocking level of 6.5 ac/AUM. Actual use for FFR pastures 18 and 19 was unknown because they were used in conjunction with other private pastures along Battle Creek. Precipitation ranged from 11.8 to 33.1 inches at the Silver City weather station, with below average precipitation (23 inches) occurring in 7 of 16 years (Fig. 19).

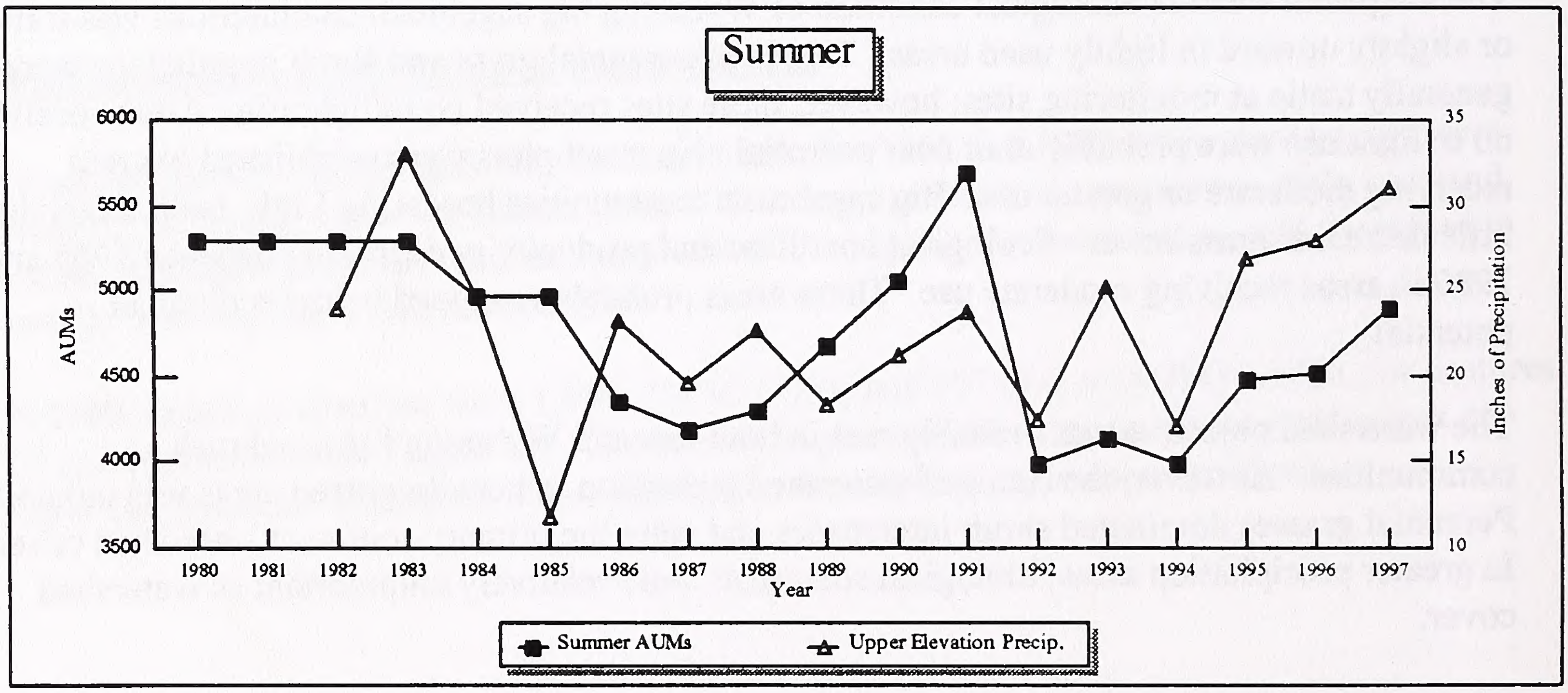


Fig. 19. Actual livestock use (AUMs) and yearly precipitation (Silver City weather station) in summer pastures, Battle Creek Allotment, 1980-97.

Trend

- Historic Condition Mapping

Pasture 14 was generally rated in fair to good condition prior to 1967 when it was used in May and June (Maps, 9, 10). Some mountain big sagebrush communities in the pasture were treated with herbicide in 1967 to remove sagebrush, improve condition, and increase forage production. Since 1967, pasture 14 has been grazed in July or September. In 1980, mountain big sagebrush communities were rated in good condition, while low sagebrush communities were rated in fair or poor condition, depending on the relative amount of deeper and shallower soil sites within the area (Map 11). Concentrated livestock use along fencelines between pasture 14 and pastures 18 and 19 resulted in lower ecological condition ratings. Spraying in 1967 to remove sagebrush did not change the ecological condition. Composition of decreaser grasses improved on the burned area. Eight acres burned in pasture 14 in 1992 (Map 12).

Pasture 20 has been grazed in July-August or August-September since at least the 1960s. Pasture 20 was primarily rated in good condition in 1959 and 1966 (Maps 9, 10). Similar to pasture 14, 1980 condition ratings were related to dominant shrub species and soil depth (Map 11). Mountain mahogany and playa communities were rated in poor condition.

Grass understories were dominated by decreaser or decreaser and increaser species (Map 13). Shallow soil sites and areas of concentrated livestock use (Dry Creek, reservoirs) were dominated by increaser grasses.

- NPFT

Four transects were established in summer pastures in 1983 (Map 7). Trends in frequencies of Thurber's needlegrass, squirreltail, and longleaf phlox were static to downward in mountain big sagebrush communities (09S01E11, 09S01W11, 09S01W35) between 1983 and 1998 (Figs. 20, 21). Trends in frequencies of bluebunch wheatgrass, rabbitbrush, and bitterbrush were static (Figs. 20, 22). Trends in frequencies of Idaho fescue, Sandberg bluegrass, and lupine were static to upward (Figs. 20, 21). Trends in frequencies of mountain big sagebrush were downward (Fig. 22). Frequencies of bluebunch wheatgrass and squirreltail fluctuated inversely during some samples at site 09S01W35, which may reflect inconsistent identification.

Trends in frequencies of bluebunch wheatgrass and Idaho fescue were static at the low sagebrush site (10S01E07) between 1983 and 1998 (Figs. 20, 22). Trend in frequency of Sandberg bluegrass was upward, but squirreltail and longleaf phlox were downward (Figs. 20, 21). Trend in frequency of low sagebrush remained static (Fig 22).

- Photo Plots/View Photos

Perennial grasses were static or declining in mountain big sagebrush communities adjacent to developed water sources between 1983 and 1998 (Table 17). Perennial grasses were static or increasing adjacent to Dry Creek between 1970 and 1998. Between 1990 and 1994, recruitment of shrubs occurred concurrently with mortality, stress, and reduced vigor in perennial grasses.

Vigor of perennial grasses recovered in 1998 with some recruitment occurring. Sagebrush vigor declined at some sites in 1998 and tent caterpillar infestations were observed in many bitterbrush populations.

Trends in abundance of perennial grasses and shrubs were static and static to increasing, respectively, in the low sagebrush community (Table 17).

Table 17. Apparent trend in abundance (D = downward, S = static, U = upward) of perennial grasses and shrubs in photo plots and view photos, summer pastures, Battle Creek Allotment, 1983-98.

Transect	Range Site	Evaluation Period	Grasses		Shrubs	
			Plot	Photos	Plot	Photos
09S01E11	Mountain big sagebrush	1983-98	S	S	S	D
09S01W11	Mountain big sagebrush	1983-98	S-D	S	S-D	S-D
09S01W35	Mountain big sagebrush	1983-98	S-D	S	S	S-D
10S01W02A	Mountain big sagebrush	1970-98	U	S-U	U	S
10S01W02B	Mountain big sagebrush	1970-98	S-D	S-U	U	S
10S01E07	Low sagebrush	1983-98	S	S	U	S

- Cover Point

Percent cover averaged 8.5 ± 2.2% (mean ± 95% confidence interval) (n = 18) for decreaser grasses, 1.6 ± 0.6% (n = 18) for increaser grasses, 1.8 ± 1.5% (n = 16) for biological soil crusts, and 32.6 ± 5.3% (n = 20) for bare ground between 1983 and 1998. Trend in decreaser grass cover was static between 1973 and 1998; however, cover decreased in 1990 and 1994 ($P = 0.003$) (Fig. 23). Size and productivity of decreaser grasses declined and mortality occurred during the 1987-94 drought.

Biological soil crusts were maintained between 1983 and 1998 (Fig. 23). Bare ground increased significantly from 1983 to 1987 and remained relatively high through 1998. Bare ground increased in proportion to decreases in nonpersistent litter. Perennial grass production was much higher in 1983, an above normal precipitation year, than in subsequent years. Even though utilization was light in recent years, non persistent litter declined since 1983.

Range Improvements

Two reservoirs, five troughs, and 8.4 miles of pipeline were constructed in pasture 14 between 1960 and 1991. Pasture 14 was sprayed to reduce shrub cover in 1967 and a fence was constructed to protect the treated area in 1967. The fence separated the late spring range in pasture 22 from the summer range in pasture 14.

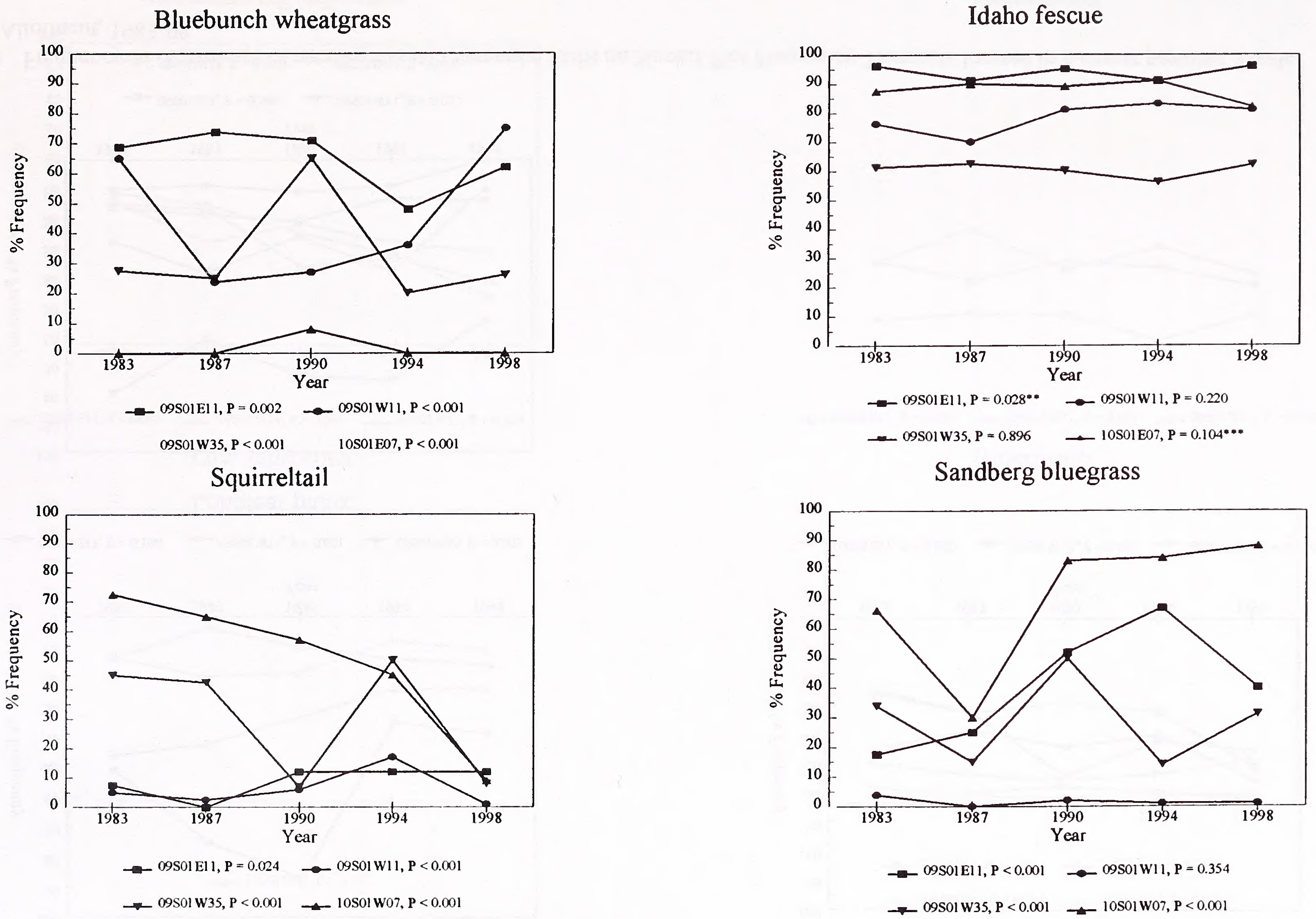


Fig. 20. Frequency of occurrence of perennial grasses on Nested Plot Frequency Transects located in summer pastures, Battle Creek Allotment, 1983-98.

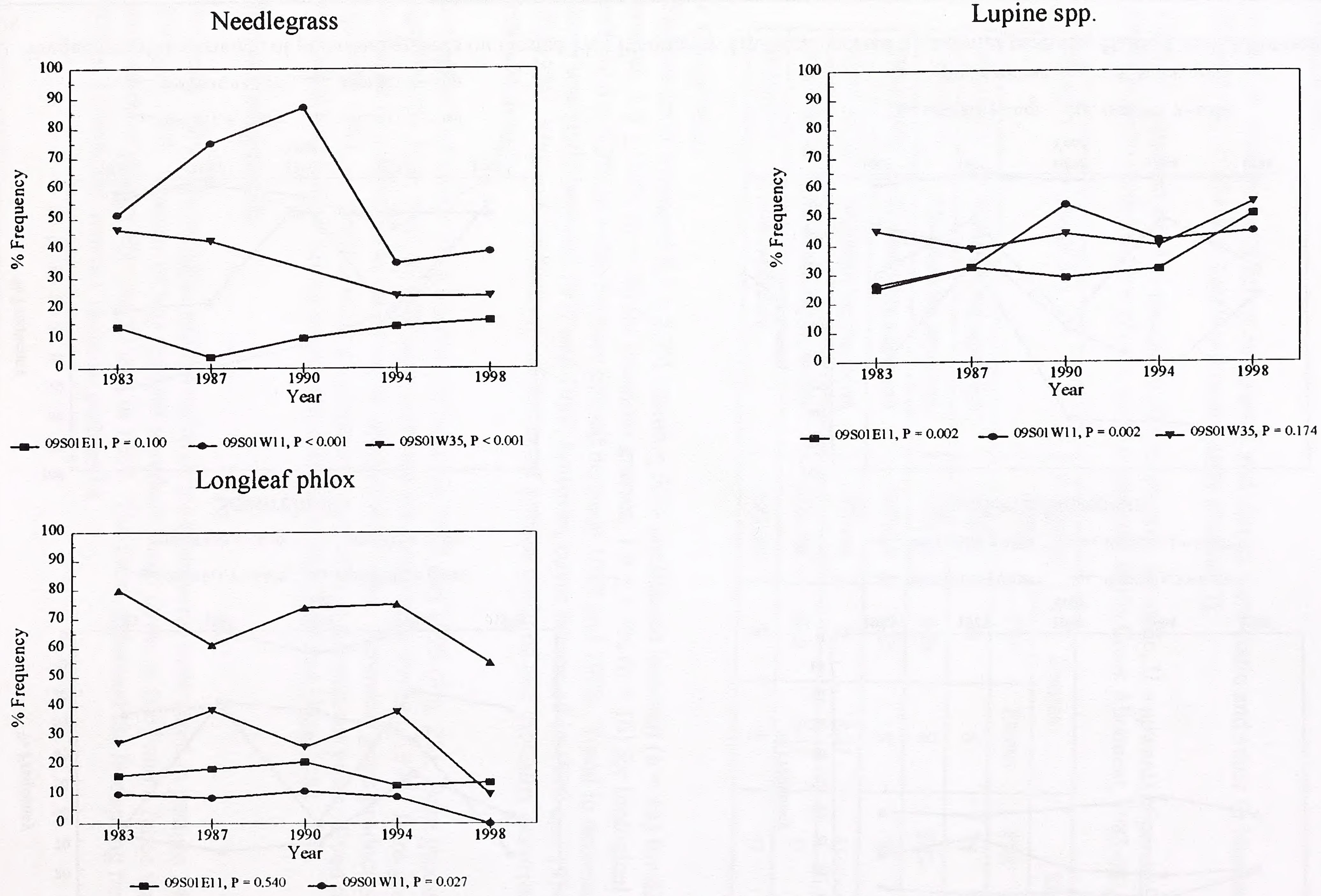


Fig. 21. Frequency of occurrence of needlegrass and perennial forbs on Nested Plot Frequency Transects located in summer pastures, Battle Creek Allotment, 1983-98.

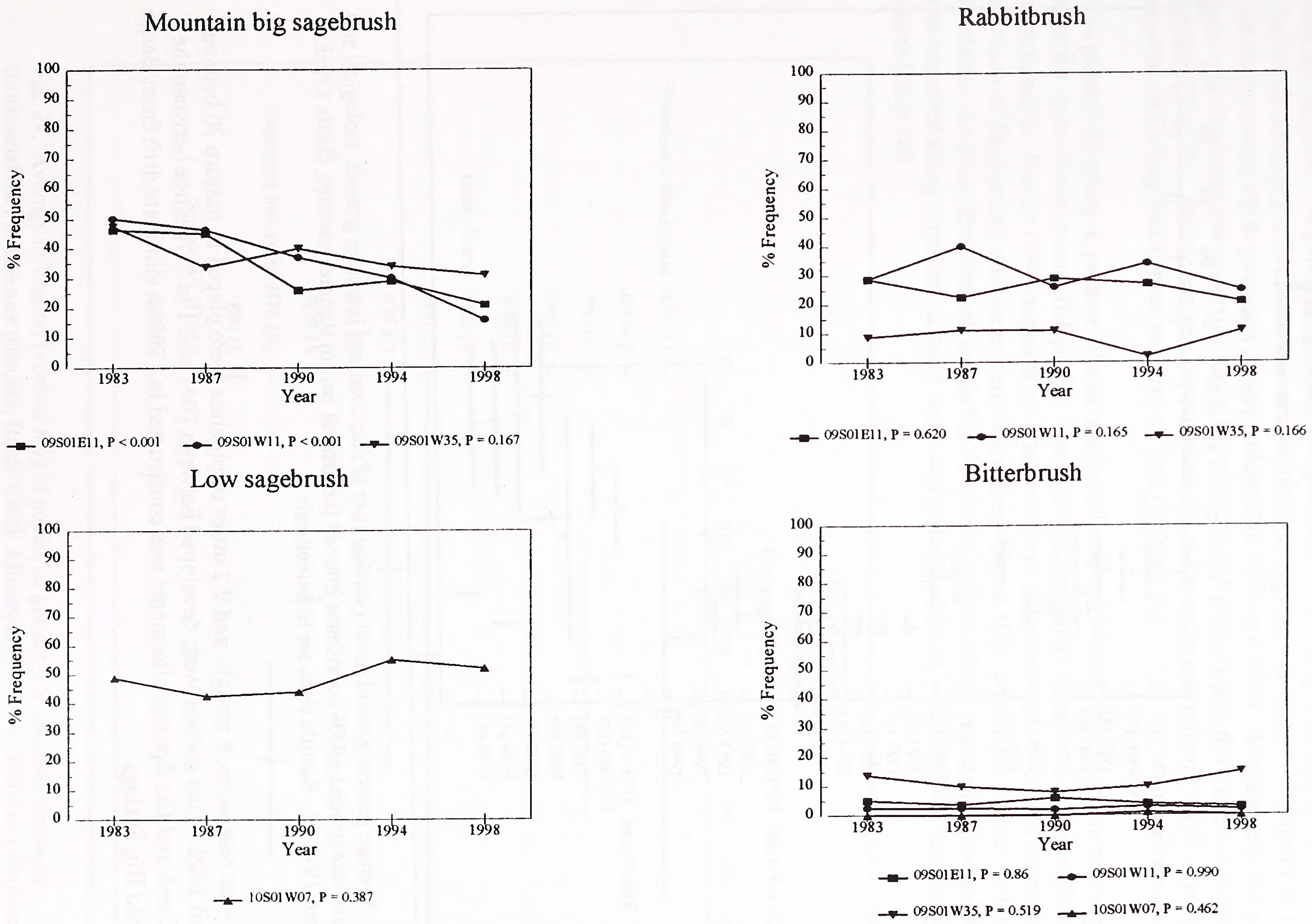


Fig. 22. Frequency of occurrence of shrubs on Nested Plot Frequency Transects located in summer pastures, Battle Creek Allotment, 1983-98.

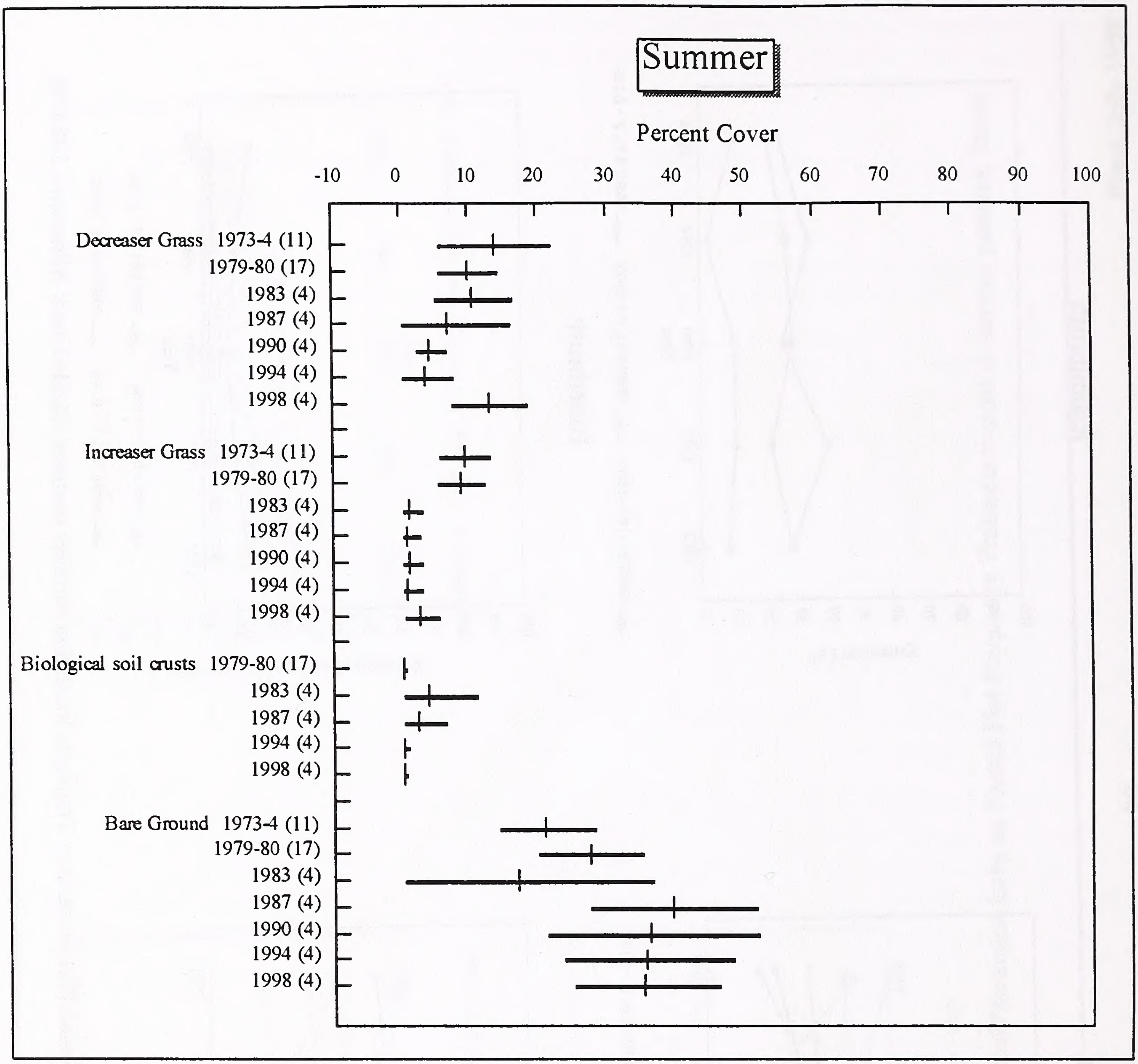


Fig. 23. Average percent ground cover (vertical bar) of decreaser and increaser grasses, biological soil crusts, and bare ground ±95% confidence interval (horizontal bar) in summer pastures, Battle Creek Allotment, 1973-98. Sample sizes are in parenthesis.

Twenty-one reservoirs, 8 troughs and 9.2 miles of pipeline were placed in pasture 20 between 1942 and 1992. Two springs were developed between 1944 and 1967. A fence between the Battle Creek and Big Springs allotments was constructed in 1968 to eliminate drift from Battle Creek into Big Springs.

Utilization/Use Pattern Mapping

Average utilization of perennial grasses was generally < 50% (Fig. 24). However, utilization of bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass was often > 50% prior to 1994. Use pattern mapping in pasture 14 was conducted in 1993 and 1996. Average use was generally light with moderate use occurring along the pipeline and slight use in the southeast portion of the pasture (Map 15). Heavy use was encountered around troughs and mineral block sites, along the pipeline and along fences near pastures 12 and 18 (Map 16).

Use pattern mapping in pasture 20 was conducted during 1993-95. Average use was slight to light for most of the pasture (Map 15). Use occurred primarily in mountain big sagebrush communities. Use in 1994 ranged from none to severe. Moderate use occurred primarily along portions of the pipeline and the eastern fence line. Use in 1995 was slight overall with light to moderate use along the pipeline and in the northwest portion of the pasture. Moderate to severe use occurred along pipelines, around water and mineral sources, and along the eastern pasture fence (Map 16).

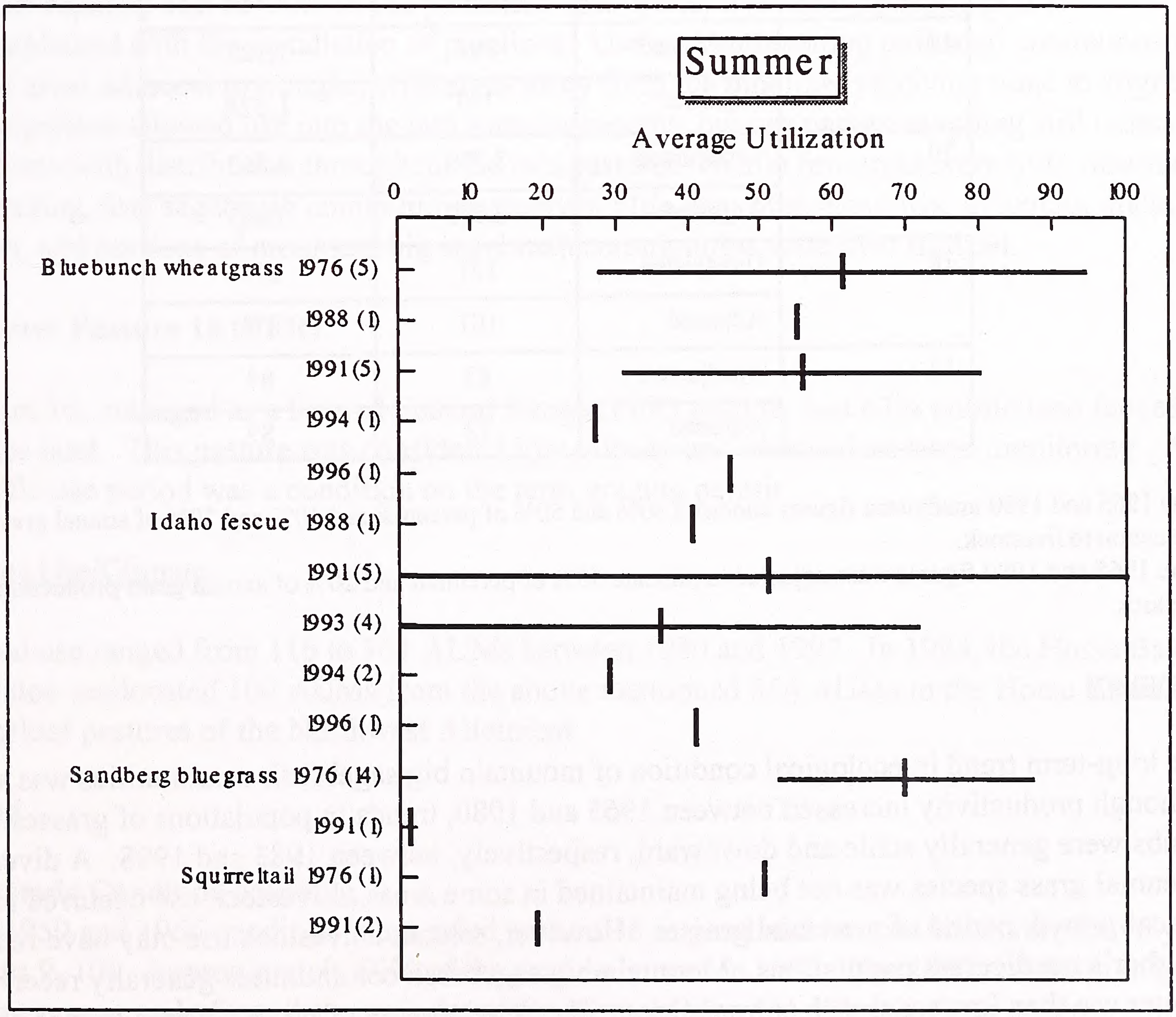


Fig. 24. Average utilization (vertical bar) of perennial grasses ± 2 standard deviations (horizontal bar) in summer pastures, Battle Creek Allotment, 1976-96. Number of utilization transects per mean is shown in parenthesis.

Potential Stocking Levels Based on Forage Surveys

Forage production ratings were the same between 1965 and 1980 for low sagebrush communities, and were static or upward for mountain big sagebrush communities (Maps 17, 18). Spraying or burning generally increased forage production in treated areas. Shallow-soiled low sagebrush areas had lower production ratings in 1980 (Map 18).

Grazing capacities in 1980 were 1,328 AUMs (6.0 acres/AUM) and 3,863 AUMs (7.3 acres/AUM) for pastures 14 and 20, respectively (Table 18). Cheatgrass comprised only 1% of the forage production in pastures 14 and 20 when determined at 50% allocation of annual and perennial grasses. Limitations in potential stocking levels caused by lack of water and livestock avoidance of low sagebrush communities were not considered.

Table 18. Potential stocking levels (AUMs) based on 1965 and 1980 forage production surveys for summer and FFR pastures, Battle Creek Allotment.

Pasture		1965	1980
14	Unadjusted[a]	997	1,328
	Adjusted[b]	777	1,328
20	Unadjusted	3,709	3,863
	Adjusted	2,889	3,863
18	Unadjusted	137	214
	Adjusted	107	214
19	Unadjusted	83	89
	Adjusted	72	89

[a] The 1965 and 1980 unadjusted figures allocated 60% and 50% of perennial and 10% and 20% of annual grass production to livestock.

[b] The 1965 and 1980 figures were adjusted to allocate 50% of perennial and 20% of annual grass production to livestock.

Summary

The long-term trend in ecological condition of mountain big sagebrush communities was static. Although productivity increased between 1965 and 1980, trends in populations of grasses and shrubs were generally static and downward, respectively, between 1983 and 1998. A diversity of perennial grass species was not being maintained in some areas. Livestock use occurred after the critical growth period of perennial grasses. However, selective livestock use may have reduced Thurber's needlegrass populations. Mountain big sagebrush communities generally received greater use than low sagebrush communities. The development of water sources shifted some grazing use from uplands adjacent to natural water sources to those associated with water developments. Grass and shrub abundance increased in areas adjacent to natural water sources.

Grass populations remained static or slightly decreased in areas associated with developed water sources. Static trends are acceptable in communities that are at or near site potential. Static or downward trends are not acceptable in communities that are below site potential.

The long-term trend in ecological condition of low sagebrush communities was static. Trends in populations of grasses and shrubs were generally static. Low sagebrush communities had substantial rock cover and, consequently, received none to light livestock use. Low sagebrush communities were generally at or near site potential.

The watershed objective was generally met, but declines in litter cover still occurred. Even in heavily grazed areas, shrub interspaces were stabilized by perennial grasses. Stones and gravel also provided surface cover in low sagebrush communities.

The stocking level at total preference was 8% greater than the potential stocking level. The difference may be greater because lack of water and livestock avoidance of low sagebrush communities was not considered. During 1990 to 1997, these pastures were stocked at 71-97% of their capacity and 66-90% of the permitted use. Better livestock distribution was accomplished with the installation of pipelines. Use pattern mapping indicated continuous heavy use in areas adjacent to troughs, with areas away from the pipelines receiving none to slight use. The pipelines allowed use into the late summer months, but use pattern mapping still indicated problems with distribution throughout the two pastures. While few areas were truly unsuitable for grazing, low sagebrush communities received little use. Wet meadows, mountain mahogany stands, and portions of mountain big sagebrush communities were over utilized.

Summer Pasture 16 (FFR)

Pasture 16, managed as a Fenced Federal Range (FFR) pasture, had 63% public land fenced with private land. This pasture was considered low priority and received no trend monitoring. A specific use period was a condition on the term grazing permit.

Actual Use/Climate

Actual use ranged from 116 to 364 AUMs between 1980 and 1997. In 1984, the Horse Basin Decision reallocated 100 AUMs from the above mentioned 364 AUMs to the Horse Basin and Sugarloaf pastures of the Northwest Allotment.

Trend

- Historic Condition Mapping

The 1959 and 1966 condition maps rated pasture 16 in good and fair condition respectively (Maps 9, 10). Approximately 50% of the pasture burned in 1972. The 1980 condition map rated the burn separately from the remainder of the pasture (Map 11). The northern portion, adjacent to Little Jacks Creek, was rated in poor condition.

Use Pattern Mapping

Use pattern mapping was conducted in 1992, 1994, and 1995. Average use was slight to light in the southern portion of the pasture (primarily low sagebrush communities)(Map 15). Heavy to severe use occurred along Little Jacks Creek and adjacent mountain big sagebrush communities (Map 16). The pasture received additional use when livestock from pastures 10 and 15 trespassed into pasture 16 in 1994 and 1995, due to inadequately maintained pasture boundary fences.

Potential Stocking Levels Based on Forage Surveys

Forage production ratings increased between 1965 and 1980 in the portion of the pasture that burned, and decreased in Wyoming big sagebrush communities along Little Jacks Creek (Maps 15, 16).

Grazing capacity in 1980 was 228 AUMs (4.5 acres/AUM) (Table 19).

Table 19. Potential stocking levels (AUMs) based on 1965 and 1980 forage production surveys for pasture 16, Battle Creek Allotment.

	1965	1980
Unadjusted[a]	205	228
Adjusted[a]	160	228

[a] The 1965 and 1980 unadjusted figures allocated 60% and 50% of perennial and 10% and 20% of annual grass production to livestock.

[b] The 1965 and 1980 figures were adjusted to allocate 50% of perennial and 20% of annual grass production to livestock.

2. Riparian/Aquatic Resources

a. Stream Inventories

Major drainages in the allotment include Battle, Little Jacks, and Shoofly creeks. About 30 miles of stream are located on public land in the Battle Creek Allotment, including West Fork Shoofly and East Fork Shoofly creeks which are tributaries to Shoofly Creek, and OX Prong which is a tributary to Little Jacks Creek. Battle Creek is located almost entirely on private (11.1 miles of stream) or State land (1.6 miles) in the allotment, with 0.16 mile of stream on public land (which is fenced into pasture 20 to provide a water source for livestock). Riparian/aquatic habitat conditions (as determined in the MFP) were evaluated on these five streams during 1994-98 (Map 19). All of the streams inventoried had perennial flows, with some segments having intermittent flows. Additionally, about 3 miles of Dry Creek are located on public lands in the allotment. Dry Creek is a tributary to Battle Creek (Map 1) and has intermittent to perennial stream flows that support riparian plant communities

Riparian/Aquatic Habitat Condition

The condition of riparian/aquatic habitat on streams in the allotment was greatly influenced by whether livestock had access to the stream (Appendix D). Almost all stream segments were located in confined canyons with geologic parent materials composed of rhyolitic lava. The canyons either excluded most livestock access or concentrated livestock use on the stream channel because of the narrow floodplain areas (generally < 30 m wide) and steep side slopes within the canyons. Most stream segments on the allotment were comprised of B channel types, gradients of 2-4%, moderately confined by valley side slopes (Rosgen 1994) (Appendix D), and had stream substrates dominated by cobble-sized rocks. Portions of East Fork Shoofly and Shoofly creeks flowed through floodplains composed of predominately fine-grained soils.

Of 29.5 miles of stream on the Battle Creek Allotment with MFP objectives for riparian/aquatic habitat, 16.2 miles were in good condition, 6.8 miles were in fair condition, and 6.5 miles were in poor condition (Map 19). All stream segments with little or no livestock access because of vertical canyon walls, gap fencing, dense woody shrub communities, or boulder dominated stream reaches, were in good condition (Table 20). Stream segments with limited cattle access were in fair to good condition, and streams easily accessible to livestock were primarily in poor to fair condition, regardless of whether the stream was grazed by livestock in spring or summer (Table 20). Information on proper functioning condition (PFC) of these stream segments is not presented because to meet MFP habitat objectives the streams must minimally be in PFC. "The threshold for any (habitat) goal is at least PFC because any rating below this would not be sustainable" (USDI 1993).

Dry Creek was not specifically assigned an MFP objective for stream/aquatic habitat condition. The condition of Dry Creek was assessed in July 1998 relative to whether it was properly functioning. The downstream most segment of Dry Creek (stream miles 3.7 to 5.3) in the allotment and the lowest 0.6 mile of segment DRY_005.3 were rated as functioning at risk with an upward trend. Streambanks and floodplains in these segments were not adequately vegetated with riparian plant species to stabilize them against the cutting action of high stream flows. In the lower segment (DRY_003.7) the stream channel has incised through a formerly wet meadow and has not developed a new floodplain at the current elevation of the channel. Instead multiple non-sinuous auxiliary channels with little to no riparian vegetation have been carrying about one-half of the bankfull flows. The stream is at risk to further incisement and drying of meadow soils without increasing the vigor and cover of streambank plant communities. The segment from stream mile 6.4 to 7.2 was in proper functioning condition. This segment of stream was located between two parcels of private land on the upper section of Dry Creek that has intermittent/perennial stream flows.

- Trend

Overall, the condition of riparian/aquatic habitat of streams in the allotment improved from 1983 to 1995 (Map 20). The length of stream segments in the allotment in good condition increased from 12.0 to 16.2 miles, with most of this change due to stream segments improving from fair to good condition. The number of stream miles in poor condition was similar between 1983 (5.3 miles) and 1995 (6.5 miles). However, trends in riparian/aquatic habitat condition differed among drainages (Map 20). The length of stream in good condition increased for Little Jacks and West Fork Shoofly Creeks (14.6 miles in 1995 versus 9.4 miles in 1983), while trend in the condition of OX Prong was static at poor. A downward trend in condition was observed for East Fork Shoofly and Shoofly creeks (length of stream in fair to good condition declined from 6.8 to 3 miles, while the length in poor condition increased from 0 to 3.8 miles).

Table 20. Riparian/aquatic habitat ratings for streams inventoried in the Battle Creek Allotment, grouped by the accessibility of the stream segment and the season it was grazed.

Accessibility and Season of Use	Miles of Stream per Habitat Rating		
	Poor	Fair	Good
No Access	0.0	0.0	14.8
Limited Access	0.0	3.1	1.4
Accessible/Spring Use	4.2	1.6	0.0
Accessible/Summer Use	2.3	1.8	0.0
Totals	6.5	6.8	16.2

In 1994, much of the downstream-most segment of Little Jacks Creek (LJACK005.3) in the allotment was rated at the upper end of the fair condition category. All of this segment was rated in good condition in 1983. This portion of Little Jacks Creek is typically grazed in spring. When the stream segment was evaluated in September 1994, the stream was being grazed by livestock and apparently had been for much of the summer. Summer long use resulted in the overutilization of herbaceous vegetation and some physical damage to streambanks from trampling and shearing. Late summer use was extensive enough to result in most of the segment being rated in fair condition (at the upper end of the fair category).

During 1995-98, livestock use of Shoofly and East Fork Shoofly Creeks was reduced or eliminated. BLM re-inventoried the first 1.8 miles of East Fork Shoofly Creek upstream from the confluence with West Fork Shoofly Creek in May 1998, and conducted additional habitat monitoring on Shoofly Creek (stream segment SHOOF018.0 in pasture 21) in October and November 1998.

Reducing or eliminating livestock use of herbaceous vegetation and young woody shrubs resulted in the improvement of riparian/aquatic habitat conditions on the East Fork of Shoofly Creek to the lower range of the fair category. In particular, herbaceous species and young woody shrubs were colonizing bare soil areas along the stream. Habitat monitoring on Shoofly Creek also showed an upward trend in riparian/aquatic habitat condition, with the stream segment rated in fair condition in 1998. The amount of streambank on Shoofly Creek that was vegetated and stable increased from 59 to 75%, and the amount of streambank that was bare and unstable decreased from 22 to 12% during 1995-98. The amount of stream shading from riparian vegetation also increased.

In 1998, the majority of the plant communities on Shoofly Creek (segment 18.0 in pasture 21) were still early successional community types (68%). The ecological status rating for the segment was 38, which placed the stream segment in the early successional category. Only 32% of the greenline of this stream segment was occupied by late successional plant community types. The greenline stability rating for this segment was 6.2, which indicates a moderate level of stability.

- Streams Identified for Improvement

A total of 11.9 miles of Shoofly (2.1 miles), East Fork Shoofly (3.9 miles), Little Jacks (4.6 miles), and OX Prong (1.3 miles) creeks were identified to be improved from poor to fair and good condition in the MFP (Map 19). Additionally, 0.2 mile of Battle Creek on BLM managed land was identified to be improved to good condition. Most of the Little Jacks Creek segments (4.0 of 4.6 miles) improved to fair or good condition, but the Shoofly and East Fork Shoofly creek segments declined in condition from 1983 to 1994 (length of stream in poor condition increased from 0 to 3.8 miles). However, by 1998 approximately 3 miles of the East Fork of Shoofly Creek improved from poor to fair condition due to the elimination or reduction of livestock use on these stream segments from 1995 through 1998. Habitat conditions on OX Prong were static (1.3 miles in poor condition). The first 0.2 mile of the West Fork Shoofly Creek above the confluence with the East Fork declined from fair to poor condition because the stream abandoned the former channel and began flowing down an adjacent road. The segment of

Shoofly Creek identified for improvement was also impacted in several areas by a road located in the valley bottom. The Battle Creek segment improved from poor to fair condition.

Overall the number of stream miles in poor versus fair to good condition did not differ significantly between 1983 (4.8 miles in poor, 4.8 miles in fair, and 2.3 miles in good condition) and 1994 (5.7 miles in poor, 3.8 miles in fair, and 2.6 miles in good condition) (Chi-square, $P = 0.74$). The amount of stream in the different condition categories also did not differ significantly between 1983 and 1998 (2.7 miles in poor, 6.8 miles in fair, and 2.6 miles in good condition) (Chi-square, $P = 0.64$).

Summary

The primary determinant of the condition of riparian/aquatic condition of streams in the Battle Creek Allotment was whether livestock had access to the stream. Streams accessible to livestock in spring and summer pastures in the Battle Creek Allotment were in poor to fair condition. This was because livestock were concentrated on the narrow (generally < 30 m wide) valley bottoms in the stream canyons, resulting in physical damage to streambanks and often over utilization of riparian vegetation.

Much of Shoofly and East Fork Shoofly creeks were accessible to livestock, were grazed by livestock primarily in June and sometimes into July and August (prior to 1995), and were primarily in fair condition with an upward trend in 1998. These segments of Shoofly and East Fork Shoofly creeks are located in areas of fine-grained soils, which were more susceptible to livestock impacts (bank shearing, trampling, increases in the amount of fine sediment in the stream channel) than cobble-dominated segments elsewhere on the allotment (Clary and Webster 1989). Streams with B and C channel types with fine-grained alluvial soils are dependent on vigorous, late-successional plant communities for maintaining stable streambanks and channels, and withstanding the erosive forces of high flows during the spring runoff period (Clary and Webster 1989, USDA 1992). In particular, native sedges (*Carex* sp.) and rushes (*Juncus* sp.), with their extensive, fibrous root systems, are of critical importance to maintaining stable streambanks in fine-grained alluvial soils (Platts and Nelson 1991). These plants, however, are less tolerant of grazing than grasses such as Kentucky bluegrass *(Poa pratensis)*. Inventories of these segments of Shoofly and East Fork Shoofly creeks showed a substantial amount of the greenline plant communities along the streams were early successional community types composed of Kentucky bluegrass and other weakly-rooted grasses, forbs, and shrubs.

Some segments of Shoofly Creek and lower West Fork Shoofly Creek were negatively impacted by roads adjacent to the streams in the valley bottom, which captured portions of the stream flows during high runoff periods and became secondary, or in some cases, the primary stream channel. Additionally, streambanks at three trail crossings of Shoofly and East Fork Shoofly creeks were impacted by the trailing of approximately 1,200-1,600 cows down the Shoofly Creek valley each fall.

The upper portions of the Little Jacks Creek drainage (OX Prong and perennial to intermittent portions of the headwaters of Little Jacks Creek) were in poor condition primarily because of the summer long grazing period, which resulted in extensive bank damage and over utilization of herbaceous and woody riparian vegetation. Segments of Little Jacks Creek with little to no livestock access had some of the best quality aquatic/riparian habitat of streams flowing from the Owyhee Mountains to the Snake River. Livestock are excluded from these segments of Little Jacks Creek by steep canyon walls, a boulder-dominated stream channel at the upper end of the segments, and a fence across the lower end of the canyon. Similarly, the upper sections of East and West Fork Shoofly creeks were in good condition.

b. Stream Habitat Monitoring

Individual habitat components were in good condition on stream segments in canyons with little or no livestock access (Tables 21, 22). Some individual stream segments that were accessible to livestock met MFP standards for good condition for some habitat components, but most were in poor to fair condition. Habitat measurements for individual stream segments are shown in Appendices E and F.

Table 21. Average percent stream shading, herbaceous stubble height, and percent unvegetated stream bank (bare ground) with standard error (SE) and sample size (n) for stream segments with differing accessibility to livestock in the Battle Creek Allotment, 1994-95.

Canyon Accessibility and Season of Use	% Stream Shading			% Unvegetated Stream Bank (bare soil)			Herbaceous Stubble Height (inches)		
	Mean	SE	n	Mean	SE	n	Mean	SE	n
No Access	74.3a[a]	5.6	4	0.0a[a]	0.0	4	24.4a[a]	10.3	3
Limited Access	27.2b	8.9	2	1.0ab	1.0	2	3.8ab	1.2	2
Accessible/Spring	30.1b	5.9	3	15.8b	5.2	4	1.9b	0.3	3
Accessible/Summer	30.9b	6.0	2	17.3b	8.1	3	1.3b	0.2	3

[a] Common letters within columns indicate the means did not differ significantly ($P > 0.10$).

- Stream Shading

Mean percent stream shading represents the shade provided by vegetation (primarily woody shrubs and trees) growing along a stream and topographic features such as canyon walls. Shading maintains suitable water temperatures during summer months for aquatic insects and redband trout. Aquatic insects are important foods of salmonid species such as redband trout. They are an important component of streams, both those currently and potentially supporting redband trout. Percent shade for stream segments which were not accessible to livestock averaged > 60%, the MFP standard for good stream condition (Table 21). Stream shading in streams not accessible to livestock was significantly greater than that for segments accessible to livestock (1-way ANOVA test, $P < 0.01$). Stream shading did not differ significantly between segments accessible to livestock and grazed in either summer, summer/fall, or spring ($P > 0.10$).

- Streambank Vegetation

Streambank vegetation prevents bank erosion by absorbing stream energy during flood flows, and also provides shade and cover for fish. Riparian plant communities dominated by woody shrubs often occur along streams with higher gradients and narrow floodplains confined by rocky canyons. On some stream segments without an understory of rushes or grasses, stream banks are protected from erosion during high stream flows by rocks, shrub roots, and woody debris.

The amount of unvegetated stream bank along streams with limited or no access to livestock met the MFP standard of ≤ 10% bare soil for the stream segment to be in good condition (Table 21). The amount of bare soil along streams differed significantly among stream segments that were accessible and those that were not accessible to livestock (1-way ANOVA test, $P = 0.01$). Streams accessible to livestock had significantly greater amounts of unvegetated stream bank (Table 21), and the amount of bare soil did not differ between stream segments grazed in spring or summer.

- Herbaceous Stubble Height

The level of livestock use of herbaceous vegetation along streams is important because too severe of utilization of streamside vegetation results in bank trampling and shearing, livestock switching to browsing of woody plants along the stream, and the elimination of sedge and rush species that are less tolerant to grazing. In addition, overhanging herbaceous vegetation provides cover for fish along the streambank. Herbaceous vegetation, particularly native sedges and rushes with dense, fibrous roots, are important for preventing bank erosion during high stream flows.

Mean stubble heights during 1994 ranged from 1.3 to 24.4 inches (Table 21) and differed significantly among stream segments with different accessibility to livestock (Kruskall-Wallis test, $P = 0.04$). Average stubble height was greatest ($P < 0.10$) on stream segments inaccessible to livestock. Stubble height generally decreased as season of use changed from spring to summer/fall. The MFP habitat standard for good condition of ≥ 4 inch stubble height was met in 1994 only on stream segments inaccessible to livestock. In subsequent years (1995-98), a stubble height of ≥ 4 inches was also met most years on stream segments that were either rested from use or grazed primarily in spring.

- Streambank Stability

Generally, unstable, actively eroding streambanks are the primary source of fine sediments that deposit and fill in pools, reducing the amount of living space for adult fish. Fine sediment also fills the interspaces between stream gravels, habitats that are critical for the incubation of trout eggs and providing cover and hiding places for juvenile trout. Unstable banks also result in the widening and shallowing of the stream after the banks and stream channel are scoured by high stream flows, again reducing the amount of habitat in the stream for adult fish. Streams with wide, shallow channels are more easily heated by the sun to unsuitable water temperatures for trout and other fish

The MFP standard for bank stability of < 10% unstable banks to be in good condition was met on stream segments with limited to no access to livestock (Table 22). Bank stability differed significantly among stream segments that were accessible and those that were not accessible to livestock (1-way ANOVA test, P = 0.02). Stream segments accessible to livestock and grazed primarily during the spring (segments of Shoofly and East Fork Shoofly creeks) had significantly greater amounts of unstable stream bank (Table 22) than segments with little or no livestock access. Stream segments accessible to cattle and grazed in spring and summer did not meet the MFP standard of < 10% unstable banks to be in good condition. Soils in the floodplains of Shoofly and East Fork Shoofly creeks were fine-grained and contained less cobble and gravel than those of Little Jacks Creek. Thus, streambanks in the Shoofly Creek drainage were more susceptible to damage from livestock use, and more dependent on riparian plants for maintaining stable streambanks.

Table 22. Average percent unstable stream banks, percent fine sediment, and amount of instream cover for adult fish with standard error (SE) and sample size (n) for stream segments in the Battle Creek Allotment, 1994-95.

Canyon Accessibility and Season of Use	% Unstable Stream Bank			% Fine Sediment (< 0.1 inch diameter)			% Stream Providing Cover for Adult Fish		
	Mean	SE	n	Mean	SE	n	Mean	SE	n
No Access	2.8a[a]	1.8	4	7.3a[a]	1.7	7	28.0a[a,b]	9.5	3
Limited Access	5.0a	5.0	2	14.5ab	7.5	2	19.3	-	1
Accessible/Spring	49.0b	13.8	4	34.8b	7.0	4	10.6a	6.4	4
Accessible/Summer	22.2ab	10.7	3	19.0ab	13.0	2	7.0a	1.5	2

[a] Common letters within columns indicate the means did not differ significantly ($P > 0.10$).

[b] Median value reported because mean was skewed by one cover value of 3%.

- Fine Sediment

The amount of fine sediment in the stream channel is an important measure of habitat quality for spawning trout. When gravel interspaces are filled with sediment, incubating trout eggs do not receive enough oxygen. Excessive fine sediment in riffle habitats also reduces the production of aquatic insects, which are important foods for trout.

The mean percent of fine sediment (sand and smaller sized particles) on the stream bottom met the MFP standard for good condition of <15% fine sediment for stream segments with limited or no livestock use (Table 22). The percentage of fine sediment differed significantly among streams with different accessibilities to livestock (1-way ANOVA test, $P = 0.02$). Percent fine sediment was greatest in accessible stream segments that were grazed in spring. These stream segments are located on Shoofly and East Fork Shoofly creeks. The fine-grained soils of the floodplains of these streams, coupled with the greater amount of unstable stream banks (Table 22), contributed to the higher amount of fine sediment in the streams.

- Fish Cover

Instream cover provides feeding sites and security from predators. This cover is provided by large rocks, deep pools, stable undercut stream banks, dead branches and other woody debris, and overhanging vegetation within one foot of the water surface. The average percent instream cover available to fish met the MFP standard for good condition of 25% for stream segments with no livestock access (Table 22). Mean percent instream cover did not differ significantly among stream segments with different accessibilities to livestock (1-way ANOVA test, $P = 0.54$).

- Pool to Riffle Ratio

Pools provide cover, foraging, and resting areas for adult trout. Streams with about 40 to 60% of the channel made of pools provide quality habitat for adult fish and have enough riffle habitats for the production of aquatic insects and the spawning and rearing of juvenile fish. The average percentage of pools ranged from 11 to 40% (Table 23). Mean pool to riffle ratios differed significantly among streams with different accessibilities to livestock (1-way ANOVA, $P = 0.08$). Accessible streams with summer grazing had significantly fewer pools than streams inaccessible to livestock (Table 23). Excessive livestock grazing can affect stream morphology (including pool depths and the proportion of the channel comprised of pools) by eliminating riparian plants needed to maintain stable streambanks and channels necessary for pool formation and maintenance.

Table 23. Pool to riffle ratios, mean pool depth, and stream width to depth ratios with standard error (SE) and sample size (n) for stream segments in the Battle Creek Allotment, 1994-95.

Canyon Accessibility and Season of Use	Pool:Riffle Ratio			Mean Pool Depth (feet)			Stream Width:Depth Ratio[a]		
	Mean	SE	n	Mean	SE	n	Mean	SE	n
No Access	40:60a[b]	6.4	8	0.40a[b]	0.08	4	26.5a[b,c]	5.0	8
Limited Access	30:70ab	10.0	2	0.90	-	1	18.6a	0.3	2
Accessible/Spring	24:76ab	10.1	4	0.34a	0.11	3	27.8a	5.0	4
Accessible/Summer	11:89b	11.0	3	-	-	-	40.9a[c]	14.1	3

[a] Average stream width divided by the average stream depth.

[b] Common letters within columns indicate the means did not differ significantly ($P > 0.10$).

[c] Median value reported because mean was skewed by one outlying value.

- Pool Depth

Deep, low velocity pools with extensive cover have been found to support the most stable trout populations (Raleigh et al. 1984, Lewis 1969). Deep pools are particularly important during the winter because they are less likely to freeze. Trout in the allotment were commonly observed foraging at the upstream and downstream ends of pools where they could most efficiently capture prey items. Mean pool depths of the allotment streams ranged from 0.34 to 0.9 feet (Table 23). The depth of pools did not differ significantly among stream segments with different levels of accessibility to livestock (1-way ANOVA, $P = 0.24$). No pools were sampled in accessible stream segments receiving summer grazing (Table 23).

- Stream Width to Depth Ratio

Smaller stream width to depth ratios provide better quality habitat for redband trout and other native fish (ie. riffles are deep enough to cover adult fish). Streams with smaller width to depth ratios are also not as susceptible to increases in water temperatures due to solar radiation. Mean width to depth ratios of streams in the allotment ranged from 18.3 to 40.9 (Table 23). Average width to depth ratios did not differ significantly among stream segments with different accessibilities to livestock (Kruskall-Wallis test , $P = 0.26$). Almost all stream segments in the Battle Creek Allotment were classified as having B channel types (Rosgen 1994). B channel types have gradients of 2-4%, are moderately confined by valley side slopes and terraces, with moderate width to depth ratios of > 12. Width to depth ratios of B channel types are smaller than those of C stream types, which are located in lower gradient (0.1-2.0%), unconfined valley portions of stream drainages. The width:depth ratios observed on Little Jacks and Shoofly creek segments (Table 23) were in the upper one-third of the distribution of width:depth ratios of B channels reported by Rosgen (1996).

Summary

The individual stream and riparian habitat components examined showed the same pattern as the overall habitat ratings. Stream segments on the allotment with no access to livestock were in good to excellent condition for the individual habitat parameters examined, and mean values for segments with limited access generally met MFP standards. Mean values of habitat components for stream segments that were accessible to livestock were all in the poor to fair range because the narrow floodplains associated with the canyons concentrated livestock use on the streams. Stubble heights of herbaceous vegetation on stream segments (Shoofly and East Fork Shoofly creeks) grazed primarily in June did not meet the MFP standard of 4 inches in 1994. This was likely due to livestock remaining in the pasture after June 30, and/or impacts from fall trailing of livestock down Shoofly Creek. Stubble heights for these stream segments at the end of the 1995-98 growing seasons generally met the MFP standard (Table 24).

Herbaceous Utilization Monitoring

Utilization of herbaceous riparian vegetation was monitored (by measuring residual stubble height in the fall) from 1994-1998 on stream segments identified for improvement in the MFP. Stream segments grazed during the summer that were accessible to livestock had stubble heights < 4 inches with the exception segment LJACK024.5 of Little Jacks Creek in 1995 and 1998 and OX Prong Creek in 1998 (Table 24). Accessible stream segments receiving primarily spring (June) grazing generally met the stubble height standard of 4 inches after 1994 (Table 24).

Table 24. Median height of residual stubble of herbaceous riparian vegetation on stream segments accessible to livestock and identified for improvement in the 1983 MFP, Battle Creek Allotment, 1994-97.

Stream	Segment Number	Pasture Number	Grazing Season	Median Stubble Height (inches)				
				1994	1995	1996	1997	1998
Little Jacks	LJACK023.4	10, 15	Summer	1.5	2.0	2.5	1.5	3.0
	LJACK 024.5	16	Summer	-[a]	7.0	3.0	-	8.0
OX Prong	OXPRO000.0	15	Summer	-	1.0	2.0	2.5	6.0
Shoofly	SHOOF018.0	22	Spring	1.5	9.0	-	-	≥10
E. Fork Shoofly	EFSHO019.3	22	Spring	1.0	5.0	3.0	24.5	≥18

[a] Stubble height was not measured.

In 1995 and 1996, livestock accessed segments of Little Jacks Creek (stream miles 9.8 to 15.3) from the Northwest Allotment by traveling down the tributary drainage of Rattlesnake Creek, while the cattle were being moved in the fall to base property of one of the Battle Creek permittees. Utilization levels were examined in fall 1995 on the length of Little Jacks Creek in the Battle Creek Allotment. Segments of upper Little Jacks Creek receiving summer long use had heavy to severe utilization levels. No cattle use occurred in the non-accessible portion of the canyon from stream mile 21.0 downstream to the confluence with Rattlesnake Creek. From the confluence of Rattlesnake Creek downstream to stream mile 9.8, use was moderate to heavy. In the lower canyon of Little Jacks Creek from stream mile 9.6 down to mile 5.2, livestock use was light to moderate.

Summary

Proper utilization levels of herbaceous and woody riparian vegetation were not maintained under summer-long grazing with the exception of OX Prong Creek in 1998. The reduction or elimination of livestock use on East Fork Shoofly and Shoofly Creek resulted in the stubble height standard being met on both of those streams in 1995, 1997, and 1998. In particular, herbaceous vegetation on East Fork Shoofly Creek showed a marked response to the reduction in livestock use in 1997-98. Careful supervision of livestock in pastures 10 and 15 in 1998 resulted in OX Prong Creek meeting the stubble height standard.

Riparian Shrub Monitoring

Percent cover of riparian shrubs was monitored on a segment of Shoofly Creek (3 sites) and in a riparian area associated with Chokecherry Spring in pasture 22 (Table 25). Cover of riparian shrubs declined on Shoofly Creek from 1984 to 1994. Many of the riparian shrubs on Shoofly and East Fork Shoofly Creek were older-aged plants with little recruitment of younger-aged plants (Table 26). The decline in shrub cover from 1984-94 corresponded to a static trend in the overall condition of riparian-aquatic habitat for the 18.0 segment of Shoofly Creek. In 1994, all stream segments of Shoofly Creek and East Fork Shoofly Creek were rated in poor to fair condition with the exception of the upper most segment (mile 22.4) of East Fork Shoofly Creek. The age composition of woody shrubs on stream segments in poor to fair condition in the Shoofly drainage differed from that of stream segments in good condition on the allotment (Table 26). From 1995-98, cover of riparian shrubs on Shoofly Creek increased (Table 25). The trend in the condition of riparian-aquatic habitat of Shoofly Creek was upward during this time period due to reduced livestock use, which resulted in an increase in bank stability and reduction in the amount of bare streambank.

Table 25. Trend in riparian habitat condition in Battle Creek Allotment streams from monitoring of riparian shrub cover compared to trend from riparian/aquatic habitat evaluations, 1984-94, and 1995-98.

Time Period	Stream (segment number)	Season of Use	Site	n[a]	Shrubs (n) with cover decreasing (D), increasing (I), or static (S) (± 10%):			Trend-Mean % change in Cover	Riparian-aquatic Habitat Trend
					D	S	I		
1984-94	Shoofly (18.0)	Late Spring	1	4	3	0	1	-23	Static
			2	3	3	0	0	-59	Static
			3	3	2	1	0	-50	Static
	Chokecherry Spring (Pasture 22)	Late Spring	1	3	2	0	1	-11	NA
			2	2	2	0	0	-39	
1995-98	Shoofly (18.0)	Late Spring	1	4	0	1	3	+42	Upward
			3	3	1	0	2	+18	Upward

[a] Number of plants monitored.

Summary

Monitoring of shrubs in the Shoofly Creek drainage indicated shrub recruitment and growth were negatively impacted by livestock grazing during 1984-94. Segments of Shoofly and East Fork Shoofly creeks accessible to livestock grazing had significantly fewer young-aged shrubs than did stream segments on the allotment with limited to no cattle access, which were in good condition. In addition, shrub cover decreased on Shoofly Creek between 1984 and 1994. Because of the limited amount of forage in the narrow floodplain areas associated with Shoofly and East Fork Shoofly creeks, during 1984-94 livestock probably switched to eating woody shrubs after grazing herbaceous vegetation to < 3 inches in height (Hall and Bryant 1995, Kovalchik and Elmore 1991, Kinch 1989, Elmore and Beschta 1987). From 1995-98, livestock grazed on Shoofly Creek only in May and June and efforts were made to prevent cattle from congregating on the stream during the use period. This resulted in lower levels of browse use and an increase in riparian shrub cover.

Table 26. Percentage of riparian shrubs in different age classes on segments (60 m long) of Shoofly, East Fork Shoofly, and Little Jacks creeks, Battle Creek Allotment, 1994-95.

Age Class	Percentage of Riparian Shrubs in Different Age Classes[a]					
	Stream Segments in Poor-Fair Condition in the Shoofly Drainage			Stream Segments in Good Condition in Little Jacks and Shoofly Drainages		
	Mean	SE	n[b]	Mean	SE	n
Sprouts (1 stem)	3.0a[c]	3.0	3	13.5a[c]	4.9	4
Young (2-10 stems)	8.3a	5.2	3	47.5b	12.4	4
Mature (>10 stems, all alive)	73.7a	9.5	3	24.3b	14.2	4
Decadent (>10 stems, half dead)	11.7a	3.3	3	12.3a	4.5	4
Dead	3.3a	3.3	3	2.3a	1.4	4
Number of Shrubs	11.7	1.2	3	150.0	100.1	4

[a] From the number of plants within 3 feet of either side of the greenline (the first continuous line of perennial vegetation up from the stable low water level of the stream).

[b] Number of stream segments sampled.

[c] Common letters within rows indicate the means did not differ significantly ($P > 0.10$)

c. Springs

Sixteen springs that were accessible to livestock were located on public lands in the Battle Creek Allotment (Table 27). The majority of the springs were located in the mountain plateau region in the southern half of the allotment. Riparian vegetation maintained by spring flows provides important habitats for upland game birds, mule deer, and non-game wildlife. Most springs had surface flows for a portion of the year that provided water for wildlife and livestock. Riparian vegetation at springs was typically dominated by woody shrubs and trees including willows (*Salix* spp.), currants (*Ribes* spp.), choke cherry (*Prunus virginiana*), and quaking aspen (*Populus tremuloides*). A herbaceous understory of Kentucky bluegrass, rushes (*Juncus* spp.), or sedges (*Carex* spp.) was also usually present. Herbaceous vegetation dominated the riparian area at a few springs. Surface flows at the springs typically continued only for short distances and did not contribute to intermittent or perennial stream flows. Only small pools of surface water were found at some springs.

Table 27. Spring locations, development status, livestock use, and conditions, Battle Creek Allotment, 1995-98.

Name	Location[1]	Type of Development	Grazing Season[2]/ Livestock Access[3]		Riparian Vegetation/Impacts from Livestock
Chokecherry	8S1E25	Trough	LSpr	Limited	Riparian shrubs; Minimal use
Rosebriar	8S1E26	Trough	LSpr	Accessible	Riparian shrubs; Light impacts
Snow Creek	8S1E22	Trough	LSpr	Accessible	Willows, rushes and grasses; Severe impacts
Tigert	9S2E13	Trough	LSprSum	Accessible	Severe use by livestock
Little Tigert	9S2E14	Trough	LSprSum	Accessible	Impacted around trough, need to examine if spring source needs fencing
	9S2E31NENE	Reservoir	LSprSum	Accessible	Heavy to severe use by livestock
Hutch	9S1E27NWNE	Reservoir	Sum	Accessible	Severe livestock use
Rock	10S1E11NWNW	Trough	Sum	Accessible	Light use, but trough located in riparian area

Name	Location[1]	Type of Develop-ment	Grazing Season[2]/ Livestock Access[3]		Riparian Vegetation/Impacts from Livestock
Unnamed Development	10S1W11SESW	Trough	Sum	Accessible	Slight use, Need to examine if spring source needs fencing
Unnamed Development	10S2E5SWSE	Reservoir	FFR	Accessible	Slight use, Need to examine if spring source needs fencing
	9S2E11SENW	None	LSpr	Inaccessible	Willows, currants, sedges; No livestock use
	8S3E20NENW	None	LSpr	Inaccessible	Willows, currants, sedges; No livestock use
Upper OX Prong	9S2E17SESW	None	LSpr	Accessible	Willows, watercress; Heavy livestock use
	9S2E32NWSW	None	LSprSum	Accessible	Willows, aspen, rock armored, heavy livestock use
	10S1E17NESW	None	Sum	Accessible	Wet meadow; Stubble height of 3 inches
	9S1E27SWNE	None	Sum	Accessible	Two springs; Stubble heights of 3 inches
	9S1W35SWSE	None	Sum	Accessible	Heavy use - 1 to 3 inch stubble heights
	9S2E11NWSE	None	LSpr	Accessible	Willows and currants; No livestock use

[1] Legal description of location (Township, Range, Section, 1/41/4 section)

[2] LSpr = Late Spring, Sum = Summer, FFR = FFR pasture, permitted dates of use are 7/1 to 10/15.

[3] Access to the spring source and riparian vegetation present.

Ten springs were developed to provide water for livestock: seven springs had short pipelines from the spring source to a watering trough, and at three springs small reservoirs were dug below the spring source. Livestock had no or limited access to the spring head of three of the ten developed springs. Of the seven springs easily accessed by livestock, four springs sources were significantly impacted by livestock use. Further field investigation is needed to determine levels of livestock impacts at three springs. Three of the developments required maintenance.

Of the eight undeveloped springs located on BLM-managed lands, three received no livestock use and five were heavily impacted by livestock (heavy use of herbaceous vegetation and in some cases hoof trampling/shearing of wetland soils).

Summary

Of 18 springs on the Battle Creek allotment that did not contribute flows to intermittent or perennial streams, six had limited or no access by livestock. Riparian/wetland habitat conditions were poor at nine springs due to concentrated livestock use (soil trampling and high use of herbaceous vegetation). Three springs need further investigation to determine levels of livestock impacts.

d. Fish Populations

Distribution

In the allotment, redband trout were present in Little Jacks (downstream from the confluence with OX Prong), OX Prong, Shoofly, and East Fork Shoofly creeks (Map 8). Redband trout also were present in West Fork Shoofly Creek in 1996-97. They were the only fish species present in the Shoofly Creek drainage (East and West Forks and mainstem of Shoofly Creek). Speckled dace (*Rhinichthys osculus*), bridgelip suckers (*Catostomus columbianus*), redside shiners (*Richardsonius balteatus*), and northern squawfish (*Ptychocheilus oregonensis*) were present in the lower 3-5 miles of Little Jacks Creek. Mottled sculpin (*Cottus bairdi*) were present in Little Jacks Creek from near it's confluence with OX Prong downstream to about stream mile 9.5 (9.5 miles upstream of the confluence with Big Jacks Creek).

BLM surveys in the 1970s and early 1980s indicated West Fork Shoofly Creek was an important spawning stream for redband trout. However, stream flows in West Fork Shoofly Creek had gone underground in much of the drainage in summer 1994. When monitoring was conducted in August 1994, the stream was dry at 2 of 3 aquatic/riparian habitat monitoring sites. However, by June 1996, after the return to more typical stream flows, redband trout had recolonized the sites that were dry in 1994 and also upstream of them (the upper site was at stream mile 4.3 in the Castle Creek grazing allotment).

During 1994-95, redband trout in Little Jacks Creek were distributed downstream to where flows went underground in a highly degraded section of stream 0.1 mile downstream of the allotment boundary at stream mile 5.2. In 1996, stream flows continued about another 1.0 mile downstream through the degraded (shallow, braided stream channel) reach with trout distributed downstream to mile 5.1.

Nongame Fish Populations

Redside shiner, bridgelip sucker, and speckled dace all were abundant, and northern squawfish were common in the lower 2-3 miles of Little Jacks Creek with perennial flows (stream miles 5 to 8). Only speckled dace were distributed upstream to mile 9.5 at low densities (0.01 fish/m^2 of stream). We did not sample fish densities in the lowest 2-3 miles of Little Jacks Creek.

Mottled sculpin were abundant in Little Jacks Creek from at least mile 9.5 upstream to mile 20. Sculpin densities at 7 sample sites ranged from 0.7 to 2.5 fish/m^2, with the lowest density estimates at mile 9.5 and the highest density estimates at stream miles 15 to 20. Because sculpins and trout were abundant in this reach of little Jacks Creek and redband trout were the fish we primarily tried to sample, population estimates for mottled sculpins had extremely large confidence intervals. Therefore, the density estimates for sculpins should be viewed as relative measures of abundance. Sculpin densities at 2 sites in Little Jacks Creek, sampled in 1980, ranged from 0.7 to 1.3 fish/m^2. This indicates mottled sculpin abundance has not changed from 1980 to 1996.

Redband Trout Populations

- Shoofly Creek Drainage

Densities of adult redband trout in Shoofly Creek in 1980 averaged 0.41 fish/m^2. When these sites were resampled in 1994-95, densities of adult trout averaged 0.13 fish/m^2 (Table 28). This difference approached statistical significance ($t = 2.80$, $df = 2$, $P = 0.11$). The decline in density was probably not statistically significant because of the large variance in the 1980 samples (Table 28). Additional sampling conducted to determine the overall size of the trout population in the drainage in 1994-95, gave an overall density estimate of 0.14 fish/m^2 ($n = 6$, $SE = 0.05$), which was similar to the density for the 3 historic sites that were resampled in 1994-95.

Table 28. Density of adult redband trout (>100 mm length) and population size and standard error (SE) for sample reaches 61 m in length in Shoofly Creek drainage, Battle Creek Allotment, 1980 and 1994-95.

Sample Site	1980			1995		
	Density (fish/m^2)	Population	SE	Density (fish/m^2)	Population	SE
SHOOF014.3	0.38	28	22.9	0.01	1	0.0
SHOOF018.8	0.68	50	6.6	0.29	31	1.4
SHOOF024.2	0.17	44[b]	3.2	0.09	10	0.7
Mean Density[a]	0.41			0.14		

[a] Means not significantly different between years, t-test, $P = 0.11$

[b] Sample reach was 169 m long.

The density of adult and juvenile trout combined in the Shoofly Creek drainage was estimated at 0.8 fish/m^2 in 1980 (Table 29). When these sites were resampled in 1995, average density was 0.16 fish/m^2. The difference in density between the two sample periods was not significant (t = 2.35, df = 2, *P* = 0.14), probably because of the large variance in the 1980 samples (Table 29). Additional sampling conducted to determine the overall size of the trout population in the drainage in 1994-95, gave an estimate for the overall density of 0.24 fish/m^2 (n = 6, SE = 0.07), which was similar to the density for the three historic sites that were resampled in 1994-95.

Table 29. Density of redband trout (adults and juveniles) and population size and standard error (SE) for sample reaches 61 m in length in Shoofly Creek drainage, Battle Creek Allotment, 1980 and 1994-95.

Sample Site	1980			1995		
	Density (fish/m^2)	Population Size	SE	Density (fish/m^2)	Population Size	SE
SHOOF014.3	0.44	33	36.0	0.01	1	0.0
SHOOF018.8	1.53	114	16.7	0.35	37	1.8
SHOOF024.2	0.44	113[b]	11.3	0.13	14	0.6
Mean Density[a]	0.81			0.24		

[a] Means not significantly different between years, t-test, *P* = 0.14.
[b] Sample reach was 169 m long.

The size of the redband trout population in the Shoofly Creek drainage was estimated to be 5,600 trout, with a 95% CI of 4,550-8,500 (Table 30). The trout population in Shoofly Creek is isolated from other redband populations as stream flows rarely reach the confluence with the Snake River.

- Little Jacks Creek Population

Densities of adult redband trout in Little Jack Creek in 1980 averaged 0.68 fish/m^2. When these sites were resampled in 1995-96, densities of adult trout averaged 0.76 fish/m^2 (Table 31), which did not differ significantly from the 1980 densities (t = 0.01, df = 1, *P* = 0.82). Additional sampling conducted to determine the overall size of the trout population in the drainage in 1995-96, gave an estimate of the overall density of 0.63 fish/m^2 (n = 7, SE = 0.07), which was similar to the density for the 2 historic sites that were resampled in 1995-96.

Densities of adult and juvenile trout combined in Little Jacks Creek averaged 1.5 fish/m^2 in 1980 compared to 0.9 fish/m^2 in 1995 (Table 32). Trout density did not differ significantly between sample periods (t = 1.53, df = 1, *P* = 0.13). The exact location of the upper 1980 sample site in Little Jacks Creek was unknown (estimated to be at stream mile 16.3). Therefore, we used the mean density of the 2 sites sampled in 1995 (LJACK015.5 and LJACK020.2) that were likely closest to the 1980 sample site to compare trout densities between the 2 sample periods. If the LJACK020.2 site best represented the location of the upper sample site, then trout densities were unchanged from 1980 (1.35 fish/m^2) to 1995 (1.3 fish/m^2) for the upper sample site on Little Jacks Creek.

Table 30. Redband trout population estimate for the Shoofly Creek drainage, Battle Creek Allotment, 1994-95.

Stream Segment	Length (m)	Mean Width (m)	Trout Density fish/m^2	Population Size	95% CI[a]
SHOOF013.3	6114	1.3	0.01	79	-
SHOOF017.1	1448	1.5	0.14	304	260-521
SHOOF018.0	2092	1.6	0.35	1,172	1,172-1,238
SHOOF019.3	2896	1.8	0.40	2,085	1,147-4,483
SHOOF021.1	2092	1.3	0.39	1,061	992-1,216
SHOOF022.4	3862	1.8	0.13	904	904-967
WFSHO000.0[b]			0		
WFSHO002.5[b]			0		
WFSHO003.9[b]			0		
Total Population Size and 95% CI				5,600	4,550-8,500

[a] 95% Confidence Interval for the population estimate for that stream segment.
[b] These stream segments were dry during the summer in 1994-95. Trout inhabiting these reaches probably moved down into Shoofly Creek (segments SHOOF018.0 and downstream).

The lower sample site (just downstream of mile 9.8) was located in an area fenced to allow cattle access to the stream to obtain water. Stream habitat conditions at this site area appeared to decline from 1980 to 1995 as evidenced by the change in stream width at the sample site. In 1995, the stream had multiple shallow channels with a total width of 5.2 m compared to a width of 2.1 m in 1980. The size of the trout population at this site was similar between the 2 sample periods for a given length of stream, but the fish in 1995 were distributed across a channel that was twice as wide. Considering the change in channel conditions at the lower sample site and the uncertainty of the location of the upper sample sites, numbers of redband trout in Little Jacks Creek were similar between the 2 time periods.

Table 31. Density of adult redband trout (>100 mm length) and population size and standard error (SE) for sample reaches 61 m in length in Little Jacks Creek, Battle Creek Allotment, 1980 and 1995-96.

Sample Site	1980			1995-96		
	Density (fish/m^2)	Population Size	SE	Density (fish/m^2)	Population Size	SE
LJACK009.8	0.93	120	43.0	0.70	460[b]	248.2
LJACK016.3	0.42	47	1.2	0.82[c]	186	9.2
Mean Density[a]	0.68			0.76		

[a] Means not significantly different between years, t-test, $P = 0.82$.
[b] Sample reach was 99 m long.
[c] Mean of sites LJACK015.5 and LJACK020.2

Additional sampling conducted to determine the overall size of the trout population in the drainage in 1995-96, gave an estimate of the overall density of 0.79 fish/m^2 (n = 7, SE = 0.09). This was similar to the density for the 2 historic sites that were resampled in 1995-96.

Table 32. Density of redband trout (adults and juveniles) and population size and standard error (SE) for sample reaches 61 m in length in Little Jacks Creek, Battle Creek Allotment, 1980 and 1995-96.

Sample Site	1980			1995-96		
	Density (fish/m^2)	Population Size	SE	Density (fish/m^2)	Population Size	SE
LJACK009.8	1.72	224	58.9	0.74	486[b]	268.1
LJACK016.3	1.35	150	9.5	1.06[c]	242	10.4
Mean Density	1.53[a]			0.90		

[a] Means not significantly different between years, t-test, $P = 0.13$.
[b] Sample reach was 99 m long.
[c] Mean of sites LJACK015.5 and LJACK020.2.

The size of the population of redband trout in the Little Jacks Creek drainage was estimated to be 88,400 trout, with a 95% CI of 78,100-98,500 (Table 33). The trout population in Little Jacks Creek may potentially have genetic interchange with redband trout in Big Jacks Creek as stream flows occasionally reach the confluence with Big Jacks Creek during storm events in the winter and early spring.

Table 33. Redband trout population estimate for the Little Jacks Creek drainage, Battle Creek Allotment, 1994-95.

Stream Segment	Length (m)	Mean Width (m)	Trout Density fish/m^2	Population Size	95% CI[a]
LJACK000.0[b]		-	-	0	
LJACK003.1[b]		-	-	0	
LJACK005.3	7,241	3.2	0.68	15,756	15,525-16,220
LJACK009.8	3,057	3.0	0.74	6,787	3,302-10,547
LJACK011.7	2,896	3.3	0.66	6,307	4,874-7,837
LJACK013.5	2,896	3.6	0.66[c]	6,881	5,109-8,340
LJACK015.3	2,574	3.4	0.82	7,176	6,564-7,701
LJACK016.9	6,597	3.5	1.30	30,016	29,324-30,709
LJACK021.0[d]	2,253	3.0	0.63	4,258	4,224-4,326
OXPRO000.0	2,254	4.1	1.21	11,182	9,149-12,846
Total Population Size and 95% CI				88,400	78,100-98,500

[a] 95% Confidence Interval for the population estimate for that stream segment.
[b] These stream segments have highly degraded channels and were dry or too shallow to support trout during the summers of 1994-95.
[c] Average density for 2 sites sampled in this reach.
[d] Little Jacks Creek did not have surface flows upstream of the confluence with OX Prong (stream mile 22.2) in 1994-95.

Fish Density and Habitat Condition

The linear regression model relating adult trout density to habitat condition and percentage of pools explained 86% of the variation in trout density ($F = 28.565$, $df = 2,9$, $P < 0.001$). Both percent pools ($P = 0.02$) and overall habitat condition ($P = 0.08$) were important in predicting trout densities. Trout densities were greatest in stream segments with high percentages of pools ($\geq$ 40% pools) and in good habitat condition. The proportion of pool habitat available was correlated with the overall fisheries habitat rating ($R = 0.65$). The fisheries habitat rating is based in part on channel and bank stability, which influences the formation and maintenance of pools.

The linear regression model relating trout population size to habitat condition predicted that 109,000 trout would be present in streams in the allotment if all stream segments were in good condition compared to the 1994-95 estimate of 94,000 trout. This difference is primarily due to much of the Shoofly Creek drainage being in poor-fair condition in 1995. The model predicts 18,600 fish would inhabit Shoofly Creek drainage if all the stream was in good condition compared to the 1995 population estimate of 5,600 (95% CI = 4,500-8,500). Predicting the size of the trout population for habitats in excellent condition is not possible because the excellent habitat rating (≥ 22) is greater than the range of data used to construct the linear regression model.

Trout Population Structure

The age structure of the redband trout population in the Shoofly and Little Jacks Creeks drainages changed between 1980 and 1995. Significantly more of the trout populations in both drainages were composed of adult fish (> 1 year old) in 1995 (Chi-square tests, $P = 0.001$). In 1980, 49% of the trout sampled in the Shoofly drainage were adult fish and 51% of the fish were juveniles. In 1995, 79% of the trout were adults and 21% were juvenile fish.

In 1980, 44% of the trout sampled in Little Jacks Creek were adult fish and 56% were juveniles. In 1995, 90% of the fish sampled were adults and 10% were juvenile fish. In general, segments of Little Jacks Creek in good condition had populations of redband trout comprised of 75 to 81% adult fish. The LJACK009.6 site was sampled in May, when most juvenile fish were too small to capture, which raised the overall ratio of adult to juvenile fish.

Summary

Redband trout in Little Jacks Creek were abundant and population densities in both Little Jacks and Shoofly creeks were dependent on stream habitat conditions. Most of Shoofly Creek was in poor to fair condition and correspondingly, trout numbers were low. We think the decline in redband trout numbers in the Shoofly Creek drainage is biologically significant because it corresponds to a decline in habitat conditions (the length of stream in poor condition in the drainage increased from 0 to 4 miles between 1983 and 1995). Low stream flows resulting from an extended drought from 1990-94 may have exacerbated the effects of poor habitat conditions. However, trout densities in Little Jacks Creek remained unchanged from 1980 to 1995, even with low stream flows during 1990-94. Most of the stream habitat in Little Jacks Creek was in good condition in both 1980 and 1995, but portions of Little Jacks Creek improved from fair to good condition by 1995. Overall trout densities in Little Jacks Creek did not change with the improvement in habitat conditions, but the proportion of the population comprised of adult trout increased.

Most of the trout populations in the Little Jacks and Shoofly drainages were composed of adult fish. Portions of Little Jacks Creek that were in good fisheries condition typically had populations made up of 75-80% adult fish. Segments of Shoofly Creek had similar adult:juvenile ratios as Little Jacks Creek, but this was more likely due to poor juvenile production as trout densities were substantially lower in Shoofly Creek.

d. Water Quality

Temperature

Water temperatures were monitored in the 4 streams identified for improvement in the allotment. Water temperatures were not measured in West Fork Shoofly and Dry creeks because they have low to non-existent flows during the summer. Additionally, Battle Creek was not monitored because it flows primarily through private and state lands in the allotment. Battle Creek (from its headwaters to the confluence with the Owyhee River) is the only stream on the allotment that is currently on the State of Idaho's 303(d) list of water quality limited stream segments.

Shoofly Creek partially met State of Idaho criteria for cold water biota during the summer of 1995, but did not meet the criteria during summer months of 1993 and 1994 (Table 34). In 1996, we monitored water temperatures in Shoofly Creek at an isolated parcel of BLM land at stream mile 14.3, downstream of 2.8 miles of private land. State criteria for cold water biota were not met in 1996. East Fork Shoofly Creek was monitored during the summer of 1995 and partially supported the beneficial use for cold water biota.

Little Jacks Creek fully supported the beneficial use for cold water biota, downstream to stream mile 9.8 during the summers of 1991, 1994-97 (Table 34). At stream mile 5.2 (0.1 mile outside of the allotment boundary), Little Jacks Creek no longer met State of Idaho criteria for cold water biota when monitored during 1994-96. This site on Little Jacks Creek is at the upper end of a highly degraded stream segment with multiple shallow and wide stream channels with no stream shading. OX Prong met state criteria for cold water biota at 0.1 mile downstream of the headwater springs in 1995 and at stream mile 0.6 (1 mile downstream of headwater springs) in 1997. The maximum temperature of 19.7 °C reached at mile 0.6 in 1997 was surprisingly high, considering water temperatures at the headwater springs (just 1 mile upstream) averaged 9.8 °C during summer 1997.

Bacteria

Levels of fecal coliform bacteria were monitored in 5 streams in 1994-97 (Tables 35, 36). Battle Creek was not monitored because it is located primarily on private land, and Dry Creek was not monitored because of time constraints. Little Jacks, OX Prong, and West Fork Shoofly creeks met secondary contact recreation criteria. Shoofly Creek met state criteria in 1996, but not in 1994, 1995, and 1997 (Tables 35, 36). East Fork Shoofly Creek also met secondary recreation criteria in 1996, but not in 1995 and 1997 (Tables 35, 36). The East Fork was not monitored for bacteria levels in 1994.

All samples taken before or after the grazing season met State of Idaho criteria for secondary contact recreation. Shoofly Creek showed a large decrease in bacteria counts after the grazing season from that observed during the grazing season in 1994 (Table 35). Similarly, in 1995 and 1997, bacterial counts were low prior to grazing and then increased significantly during the grazing season in Shoofly and East Fork Shoofly creeks (Tables 35, 36). Bacteria levels increased during livestock grazing in upper Little Jacks Creek (segment 21.0 and upstream) and OX Prong during 1995 and 1997, but did not exceed State of Idaho criteria. They were not sampled during the 1996 grazing season because of time limitations.

Table 34. Stream temperatures and evaluation of water quality criteria for the cold water biota beneficial use (water temperatures of 22 °C or less with a maximum daily average of less than 19 °C), Battle Creek Allotment, 1991-97.

Stream (Segment)	n[a]	Max. Temp. °C	Date	Avg. Max. Temp. °C	Sample Interval	Criteria Met?
Little Jacks (9.8)	23[b]	22.0	8/9/91	21.5	8/8 to 8/31/91	Y
	6[b]	22.0	8/28/94	20.9	8/26 to 8/31/94	Y
	62[b]	22.0	8/5/95	19.7	7/1 to 8/31/95	Y
	62[b]	22.0	7/25/96	20.2	7/1 to 8/31/96	Y
	62[b]	20.5	8/6/97	18.9	7/1 to 8/31/97	Y
Little Jacks (5.2)	48[b]	29.0	7/16/94	25.3	7/1 to 8/31/94	N
	62[b]	25.0	7/27/95	22.5	7/1 to 8/31/95	N
	62[b]	26.0	8/13/96	23.7	7/1 to 8/31/96	N
OX Prong (1.6)	62[b]	14.5	7/25/95	13.3	71/ to 8/31/95	Y
	1[c]	19.5	-	-	7/12 to 9/30/97	Y
E. Fork Shoofly (19.3)	1[c]	28.0	-	-	7/12 to 7/26/94	N
	67[b]	23.5	8/4/95	20.0	6/26 to 8/31/95	P[d]
Shoofly (17.1, 17.6 & 18.0)	1[c]	24.0	-	-	8/24 to 9/30/93	N
	69[b]	26.7	7/25/94	23.5	6/24 to 8/31/94	N
	72[b]	22.5	7/27/95	20.0	6/21 to 8/31/95	P

[a] Number of days monitored.

[b] Monitored with a thermograph.

[c] Monitored with a maximum temperature registering thermometer; the maximum temperature was reached sometime during a 1 to 4-week sample interval, thus the exact date of the maximum temperature was unknown and the date column is blank.

[d] P = Beneficial use was partially supported; see Clark (1990).

Water Chemistry

Water chemistry elements were examined in 1979 and 1980 at Shoofly Creek (stream miles 14.3 and 19.2) and Little Jacks Creek (stream miles 9.8 and 19.9). In general, concentrations of the elements reexamined in 1994 were lower than levels measured in 1979 and 1980 (Table 37). For example, ammonia concentrations in Little Jacks and Shoofly creeks in 1979-80 exceeded current state water quality criteria on one occasion (on 10/1/79 in upper Little Jacks Creek) and were within 0.06 mg/l of state criteria on 3 other occasions. In 1994, ammonia concentrations were <0.04 mg/l in both streams. No other concentrations were at levels limiting to aquatic life in 1994.

Summary

BLM's responsibilities in addressing water quality are outlined under Idaho State Law (IDAPA 16.01.02.350 [Rules governing nonpoint source activities]):

> "nonpoint source pollution management, including best management practices, is a process for protecting the designated beneficial uses and ambient water quality. Best management practices should be designed, implemented, and maintained to provide full protection or maintenance of beneficial uses... If subsequent water quality monitoring and surveillance by the Department, based on the criteria listed in Sections 200 (General surface water quality criteria) and 250 (Surface water quality criteria for use classifications), indicate water quality standards are not met due to nonpoint source impacts, even with the use of current best management practices, the practices will be evaluated and modified as necessary by the appropriate agencies in accordance with the provisions of the Administrative Procedures Act."

In 1994, BLM began monitoring water quality to evaluate the effectiveness of current livestock management in meeting State of Idaho water quality critieria for protecting existing beneficial uses. Little Jacks Creek met State temperature criteria for coldwater biota downstream to at least an elevation of 1073 m (at stream mile 9.8). In 1997, OX Prong reached maximum water temperatures of 19.7 °C by 1.0 mile downstream of the headwater springs (which flow at a fairly constant temperature of 9.8-10.0 °C). This large increase in water temperature shows the effect of solar heating due to the low level of stream shading (approximately 25%) provided by riparian shrubs and trees. Shoofly and East Fork Shoofly creeks did not fully support the beneficial use of cold water biota (meet State of Idaho water temperature criteria) because of relatively low levels of stream shading (22-41%) provided by riparian shrubs and trees. The downstream most segment of Shoofly Creek on public land is at an elevation of 1170 m, therefore, East Fork Shoofly and Shoofly creeks have the potential to fully support State of Idaho criteria for cold water biota.

The lowest site where water temperatures were monitored on Little Jacks Creek was at stream mile 5.2, which was located about 0.1 mi into a highly degraded stream reach (and 0.1 mi outside of the allotment boundary). Water temperatures quickly increased in this degraded reach because of the lack of stream shading and the wide, shallow stream channel. The lowest 4.5 miles of Little Jacks Creek in the allotment (segment LJACK005.3) started 0.1 mile upstream of the lowest temperature monitoring site. This segment generally was well shaded and probably met cold water biota criteria for much of its length (the next upstream monitoring site was at mile 9.8).

Table 35. Fecal coliform bacteria counts for streams in the Battle Creek Allotment and compliance with State of Idaho water quality criteria for secondary contact recreation, 1994-95.

Stream	(Segment)	Fecal Coliform Count (colonies/ 100ml)[a]	Sample Date	Grazing Season[b]	Secondary Contact Recreation Criteria Met?
Little Jacks	(5.3)	460	9/21/94	A	-[c]
		3	5/18/95	D	Y
		75	6/14/95	D	Y
		4	9/7/95	A	-
	(9.8)	20	5/15/95	D	Y
		150	6/14/95	D	Y
		9	7/25/95	A	-
		9	9/7/95	A	-
	(21.0)	3	5/17/95	B	-
		3	6/13/95	B	-
		21	7/25/95	D	Y
		240	9/7/95	D	Y
OX Prong	(0.0)	93	9/6/94	D	Y
		3	5/17/95	B	-
		4	6/13/95	B	-
		43	7/25/95	D	Y
		460	9/7/95	D	Y
Shoofly	(18.0)	> 2,400	6/11/94	D	N
		43	9/23/94	A	-
		3	5/17/95	B	-
		1100	6/14/95	D	N
E. Fork Shoofly	(19.3)	4	5/17/95	B	-
	(21.1)	3	5/17/95	B	-
		1100	6/14/95	D	N
	(22.4)	3	5/17/95	B	-
		>2400	6/14/95	D	N
W. Fork Shoofly	(4.8)	43	6/13/95	D	Y

[a] To meet the secondary contact recreation criteria, concentrations of fecal coliform bacteria are not to exceed 800 colonies/100ml at any time.

[b] B = before the grazing season, D = during the grazing season, A = after the grazing season.

[c] An evaluation of meeting State of Idaho criteria is given for samples taken during the grazing season. All samples taken before or after the grazing season met criteria for secondary contact recreation.

Table 36. Fecal coliform bacteria counts for streams in the Battle Creek Allotment and compliance with State of Idaho water quality criteria for secondary contact recreation, 1996-97.

Stream	(Segment)	Fecal Coliform Count (colonies/100ml)[a]	Sample Date	Grazing Season[b]	Recreation Criteria Met?
Little Jacks	(5.3)	3	4/17/97	B	-[c]
		21	6/2/97	D	Y
	(9.8)	9	5/29/96	D	Y
		3	6/17/96	D	Y
		3	5/27/97	D	Y
		9	6/19/97	D	Y
	(21.0)	9	6/18/96	B	-
		3	5/27/97	B	-
		460	6/30/97	D	Y
		460	7/31/97	D	Y
	(22.2)	93	5/30/97	B	-
		23	7/31/97	D	Y
		3	8/23/97	D	Y
		43	9/4/97	D	Y
	(23.4)	3	5/30/97	B	-
		240	7/31/97	D	Y
		150	8/23/97	D	Y
	(24.5)	3	5/30/97	B	-
		93	7/31/97	D	Y
		93	8/23/97	D	Y
OX Prong	(0.0)	9	6/18/96	B	-
		43	6/30/97	D	Y
		21	7/31/97	D	Y
		43	9/2/97	D	Y
Shoofly	(18.0)	460	5/29/96	D	Y
		93	6/17/96	D	Y
		150	5/27/97	B	-
		1,100	6/18/97	D	N
E. Fork Shoofly	(19.3)	4	5/29/96	B	-
		240	6/17/96	D	Y
		43	5/27/97	B	-
		1,100	6/18/97	D	N
	(21.1)	4	5/29/96	B	-
		9	6/17/96	D	Y
		4	6/18/97	D	Y

[a] To meet the secondary contact recreation criteria, concentrations of fecal coliform bacteria are not to exceed 800 colonies/100ml at any time.

[b] B = before the grazing season, D = during the grazing season, A = after the grazing season.

[c] An evaluation of meeting State of Idaho criteria is given for samples taken during the grazing season.

Shoofly and East Fork Shoofly creeks were the only streams on the Battle Creek Allotment exceeding State criteria for fecal coliform bacteria during 1994-97. Shoofly and East Fork Shoofly creeks had higher loads of fine sediment than other streams on the allotment. Streambed sediment is often a reservoir for fecal coliform bacteria (Stephenson and Rychert 1982). High levels of fine sediment may have contributed to bacteria levels exceeding state standards through 1997 despite reductions in grazing levels or, in the case of East Fork Shoofly Creek, the elimination of grazing in 1997-98.

Fecal coliform bacteria concentrations increased during the summer grazing season in OX Prong and upper Little Jacks Creek, but did not exceed State of Idaho criteria. Livestock activity and use of herbaceous riparian vegetation were high on those two stream segments, but stream substrates were dominated by cobble-sized rocks. The lower levels of fine sediment in these stream segments probably contributed to bacteria concentrations remaining relatively low (≤ 460 colonies/100ml) during the 1994-97 grazing seasons.

Table 37. Water quality constituent concentrations (mg/l unless otherwise noted) for stream segments sampled on Battle Creek Allotment, 1979-1994.

Stream (Segment)	Date	pH	N - ammonia	N - nitrate	Ortho-phosphate	Phosphorus	Turbidity (NTU)	Alkalinity	Hardness	Suspended Solids	Dissolved Solids	Calcium	Chloride	Manga-nese
L. Jacks (9.8)	9/17/79	7.35	<0.05	<.005	0.17	-	6.5	33.6	24	28	234	-	49.0	<0.01
	7/31/80	7.8	<0.05	<0.01	0.10	0.12	1.4	42.0	44	-		2.0	4.1	0.01
	9/21/94	-	<0.04	2.55	-	0.13	1.5	61.0	46	1	-	14.6	5.0	-
L. Jacks (19.9)	10/1/79	7.3	0.22	0.045	0.14	-	2.3	51.5	44	3	197	-	31.0	<0.01
	7/31/80	7.9	0.13	1.1	0.06	0.09	4.7	31.0	36	-		1.4	3.0	-
Shoofly (14.3)	9/18/79	7.0	<0.05	<0.05	0.19	-	4.5	52.5	37	<2	240	-	34.0	<0.01
Shoofly (19.2)	10/1/79	7.55	0.10	0.02	0.14	-	4.2	42.4	27.8	2	224	-	48.0	<0.01
	8/21/80	7.7	0.13	<0.10	0.06	0.10	4.7	33.0	30	-	-	4.6	2.8	-
	9/21/94	-	<0.04	<0.10	-	0.09	6.0	41.0	26	6	-	7.1	3.0	-

3. Wildlife Distribution and Habitat

a. Special Status Species

There are 23 special status animal species known to occur in the Battle Creek Allotment (Appendix G), six of these species are known to be susceptible to grazing impacts and have specific Bruneau MFP objectives to improve or maintain habitat conditions. The remaining 17 species may be affected by livestock grazing to some degree, but little is known about the species in the area or their habitat needs. Sage grouse and redband trout are considered special status species, however, they are discussed in the Upland Game and Riparian/Aquatic Resources sections, respectively.

Spotted Frog

Spotted frogs have declined in three of their four genetically distinguishable populations in northwestern North America. Among the threats to the species are habitat loss due to long term effects of poor livestock grazing practices in riparian and spring areas, spring developments, and loss of beaver.

- Distribution and ecology

Idaho contains portions of two spotted frog populations. The main population occurs north of the Snake River, and the Great Basin population occurs in the Owyhee Mountains of southwestern Idaho. Spotted frogs south of the Snake River are one of three candidate species for possible listing as threatened or endangered in Idaho. Population estimates for frogs in similar stream types ranged from approximately 40 frogs/linear stream mile (Rock Creek, summer livestock use) to 110-165 frogs/linear stream mile (Stoneman Creek, late spring livestock use)(Munger et al. 1997). No population estimates were available for ungrazed streams.

In the Battle Creek Allotment, the species was found in slow moving streams, oxbows, and pools at elevations above 4600 feet. Spotted frog populations were found on Rock (pasture 20), Battle (pasture 19), and Little Jacks (pasture 16) creeks. Surveys were conducted on Dry Creek, but no populations were found.

- Potential effects of livestock grazing

Many herpetologists who have worked with spotted frogs suspect they are adversely affected by cattle grazing (C. Peterson, ISU, pers. comm.). Damage from grazing occurs on two time scales. In the short-term, cattle consume vegetation that acts as cover for frogs, larvae, or eggs, affect water quality, and trample individual frogs (Munger et al. in prep.). Of greater concern are the long-term effects of poor livestock management in riparian areas and wet meadows; which affects the vegetation and hydrology of these areas with a subsequent degradation or loss of spotted frog habitat. Hot-season grazing along streams or in wet meadows can cause a significant reduction of rushes, sedges and other bank stabilizing plants. Loss of various shrub species affects plant diversity and can cause stream downcutting and bank degradation. Grazing on wet meadow ecosystems can impact plant diversity, and lower the water table, which could reduce the size of the complex and allow sagebrush and other xeric species to invade the habitat type.

- Habitat condition in the Battle Creek Allotment

Since specific habitat requirements for the species are not well defined, it is assumed that management for good riparian habitat would be appropriate. Until spotted frog guidelines are specifically developed, long-term effects will be measured using MFP fishery habitat standards (USDI 1983a).

- Management conservation activities

A Habitat Conservation Assessment and Strategy (HCA&S) was drafted for the spotted frog in Idaho (Munger et al. in prep.). The plan recommends the development of riparian grazing systems or exclosures to improve riparian condition and spotted frog habitat. Ongoing surveys will determine the distribution and abundance of spotted frogs in southwestern Idaho. Research is being conducted by the University of Idaho and Boise State University to determine critical elements of spotted frog habitat in southwestern Idaho.

Mountain Quail

Mountain quail were once abundant and widespread in western Idaho. Over the last 40 years, populations have declined and now only remnant populations are found in their former distribution. Both forks of Shoofly Creek were identified as mountain quail habitat in the Bruneau MFP, which recommended implementation of intensive livestock management or construction of protective riparian fencing to improve condition.

- Distribution and ecology

In southwestern Idaho, mountain quail historically occurred along riparian and adjacent shrubby upland areas, including the Shoofly Creek drainage. Mountain quail were believed to require dense, brushy riparian cover (Washington Dept. of Wildlife 1993), although studies in progress are finding mountain quail will readily use drainages with broken riparian cover. Surveys were completed in the Shoofly Creek drainage in 1991 and East and West Forks of Shoofly Creek, Little Jacks Creek and OX Prong in 1997. No response calls were reported during any of the surveys, but permittees have reported sightings.

- Potential effects of livestock grazing

Livestock grazing may effect mountain quail habitat in both upland and riparian areas. Grazing can reduce plant density and prevent reproduction and recruitment of important shrub and grass species in riparian areas. Less obvious is the reduction in species diversity of native grasses and shrubs, which eliminates available food species, nesting and brood rearing habitat, and often results in willow-dominated riparian shrub communities.

- Habitat conditions in the Battle Creek Allotment

Habitat conditions were evaluated on both forks and the mainstem of Shoofly Creek. Approximately 3.3 miles were in good condition, 1.7 miles in fair condition, and 4.3 miles in poor condition (Table 38).

Table 38. Average percent stream shading and overall condition of riparian habitat by stream segment in mountain quail habitat in the Battle Creek Allotment, 1993-94.

Stream	(segment)	Stream Shading (%)	Overall Riparian Habitat Condition	Length (in miles)
Shoofly	(17.1)	–[a]	Good	0.1
	(17.2)	–[a]	Poor	0.4
	(17.6)	–[a]	Fair	0.4
	(18.0)	27	Fair	1.3
E. Fork Shoofly	(19.3)	22	Poor	1.8
	(21.1)	41	Poor	1.3
	(22.4)	40	Poor	0.8
	(23.2)	75	Good	1.6
W. Fork Shoofly	(4.8)	80	Good	1.6

[a] Data not collected for this parameter.

- Management conservation activities

A HCA&S is being developed for mountain quail in Idaho (A. Sands, pers. comm.). Conservation strategies for mountain quail are site specific and emphasize protecting low elevation winter habitat, maintaining or improving riparian areas connecting summer and winter ranges, and quail reintroduction efforts. Although not identified in the HCA&S, IDFG considers the Shoofly Creek drainage a possible reintroduction site within the next five years (A. Ogden, IDFG, pers. comm.).

Kit Fox

The distribution of kit fox is closely associated with semi-arid and desert regions of western North America, with southern Idaho being the northern most limit of its range. Shadscale habitat south of the Snake River was identified as potential kit fox habitat in the Bruneau MFP (Objective WL 2.2). At that time, no kit fox were known to exist in the allotment, but IDFG was considering reintroductions. IDFG has not implemented any kit fox reintroductions in the State, nor do they plan to do so in the foreseeable future (W. Melquist, IDFG, pers. comm.).

- Distribution and ecology

In the Great Basin, kit fox habitat is generally restricted to shadscale, greasewood, and big sagebrush habitats (McGrew 1979). Recent sightings of kit fox have been reported in the Battle Creek Allotment on the Snake River near C.J. Strike Reservoir (CDC data base). Potential kit fox habitat exists in the lakebeds landform of the allotment in pastures 8 and 21.

Kit fox densities in western Utah ranged from one adult per 1163.6 ac to one adult per 2,559.8 ac (including transients)(Egoscue 1975). These estimates suggest a potential population of 22-47 adult foxes in the lakebed communities of the allotment. Assuming that prey species diversity is lower in poor or fair condition habitats than good condition habitat (Smith et al. 1996), current potential populations in the lakebeds may be less (Egoscue [1975] did not indicate habitat condition). Other factors, such as coyote predation, could limit kit fox populations (O'Neal et al. 1987).

- Potential effects of livestock grazing

No references were found in the literature relating grazing impacts to kit fox habitat.

- Habitat condition in the Battle Creek Allotment

The lakebed area of the allotment (approximately 52,800 acres located primarily pastures 8 and 21) was identified in the Bruneau MFP as kit fox habitat. Ninety-four percent of this habitat was rated in poor condition in the updated 1980 ESI (Table 39). A static trend in condition of shadscale habitat was observed in pasture 21 and a downward trend in pasture 8.

Kit fox are opportunistic foragers (Egoscue 1962). Diets of adult kit foxes appear unique in that strong dependence on a single species was not shown; foxes selected from a wide array of prey species on their home ranges (Flinders and O'Neal 1985). O'Neal et al. (1987) reported kit fox diets comprised of $\geq$17 different prey items. Smith et al. (1996) stated that wildlife diversity was positively correlated with vegetational diversity and this diversity was greater on good rather than excellent condition range. Improving ecological condition in pastures 8 and 21 would likely improve habitat conditions for kit foxes.

California Bighorn Sheep

Bighorn sheep (*Ovis canadensis*) were common in Owyhee County prior to the arrival of European settlers. Several factors contributed to their decline and eventual disappearance in the early 1900's, including excessive hunting, scabies, competition from domestic livestock, and deterioration of habitat. Some of the last verified sightings were in 1920 in lower Battle Creek. The species finally disappeared between 1920 and 1930.

- Distribution and Ecology

California bighorn sheep were reintroduced into Little Jacks Creek in 1967. Twelve sheep were obtained from British Columbia and released in Rattlesnake Creek. The Little Jacks and Shoofly drainages in the Battle Creek Allotment were designated as California bighorn sheep habitat in the Bruneau MFP (Map 21). Population estimates for bighorn sheep in the Little Jacks Creek area ranged from 376±67 in 1991 to 189±57 in 1998 (L. Nelson, pers. comm.). Several factors for population fluctuations were cited including transplant removals, weather factors, hunting, and sampling methods. It is estimated that 20% of the California bighorn sheep in North America are located in Owyhee County and the Little Jacks herd makes up about 25% of this population. This was one of the last populations used for transplants to other areas in Idaho, as well as Nevada, North Dakota, and Oregon.

- Potential effects of livestock grazing

Bighorn sheep and livestock habitat use in the Battle Creek Allotment was monitored between 1987 and 1991. Little evidence of direct competition for forage between bighorn sheep and cattle was documented; however, both animals are primarily grazers. Livestock and bighorn use areas were generally separated spatially, temporally, or a combination of both. Spatial partitioning was primarily related to steepness of slope; livestock preferred slopes <25% while sheep preferred steeper slopes. However, bighorns did use plateaus adjacent to canyons, primarily between February and July (rams) or June and July (ewes, lambs). Livestock use of plateaus adjacent to canyons occurred in June (pasture 22) or between June and September (pastures 10, 15). Overlap between ram and livestock use occurred in plateau areas upstream of Rattlesnake Gulch, primarily those surrounding Tigert Spring, OX Prong, and upper Little Jacks Creek. The greatest degree of overlap in concurrent habitat use occurred between rams and cattle during June and early July. Movement of rams into habitats inaccessible to livestock during July may have been a response to increased temperatures (seeking shade provided by cliffs) or may have occurred in response to threshold livestock use levels. Overlap between ewe and livestock use occurred in plateau areas adjacent to lower Little Jacks Creek and between the East and West Forks of Shoofly Creek. Bighorns used springs and creeks as water sources, but spent little if any time foraging in riparian areas adjacent to them. No management actions have been taken to adjust livestock grazing to provide forage for bighorn sheep.

- Habitat condition in the Battle Creek Allotment

Canyon ecosystems in the Battle Creek Allotment have been managed to benefit bighorn sheep habitat. Of the approximately 24,600 acres of bighorn sheep habitat identified in the LUP, 46% was rated in good or excellent condition (Table 39). Bruneau MFP objective WL 3 states we are to manage big game habitat to obtain good ecological condition.

- Management conservation activities

In 1991, IDFG issued a five year plan that outlined the management strategy for California bighorn sheep in Idaho. Three of the major goals included increasing populations by 20%, establishing new populations, and increasing harvest.

An ongoing research project funded by IDFG, BLM, and the Biological Resources Division of U.S. Geologic Survey will determine if California bighorn sheep habitat is influenced by livestock grazing in habitats associated with canyon ecosystems.

Table 39. Public land acres of California bighorn sheep, mule deer, pronghorn and kit fox habitats by season of livestock use and ecological condition, from the updated 1980 condition survey, Battle Creek Allotment. Wildlife habitats were identified in the Bruneau MFP.

Season	Condition	California Bighorn Sheep Habitat	Mule Deer Crucial Winter Range	Mule Deer Winter Range	Mule Deer Seasonal Range	Pronghorn Winter Range	Pronghorn Summer Range	Kit Fox Habitat
Ungrazed	Poor	6		15	17	183	17	4,762
	Fair	49	2	47	73		73	
	Burned				26		26	2,345
	Unrated							856
Winter	Poor					30		14,709
	Burned							136
	Unrated							13
Early Spring	Poor	322		425		29,839		29,957
	Fair	1,782		1,733		2,304		
	Good	208	2	349		365		
	Burned	21		84		84		
	Unrated					4		4
Late Spring	Poor	815	388	1,790	460		426	
	Fair	8,167	8,289	7,406	3,283	7,634	5,491	
	Good	6,991	6,080	3,168	1,027	4,959	1,939	
	Excellent	267	251	91	342			
	Burned	523	201	413	166	355.	245	
Late Spring/ Summer	Poor	299		465	2,468		2,613	
	Fair	1,307		1,643	8,042		7,753	
	Good	3,791	2,334	3,941	924	125	1,986	
	Burned	56		646	319		312	
	Unrated				321		321	
Summer	Poor				3,704		3,704	

Season	Condition	California Bighorn Sheep Habitat	Mule Deer Crucial Winter Range	Mule Deer Winter Range	Mule Deer Seasonal Range	Pronghorn Winter Range	Pronghorn Summer Range	Kit Fox Habitat
	Fair			462	16,312		16,774	
	Good			338	14,673		15,089	
	Burned			39	486		525	
FFR	Poor				389		389	
	Fair				156		156	
	Good				1,132		1,132	
	Burned				807		807	
	Unrated				2		2	
Total Acreage		24,604	17,547	23,055	54,787	46,224	59,763	52,782

b. Big game

The needs of big game habitat were addressed in various objectives in the MFP. Range Management 3.2 states, "to provide sufficient food, cover, space and water for big game" and Wildlife 3 states "manage big game habitat for good ecological condition".

Mule Deer

Mule deer are the most abundant big game species in the allotment. They are widely distributed and occupy a variety of habitat types. Densities of three animals/square mile were estimated in the Battle Creek Allotment by Idaho Fish and Game (L.Nelson, IDFG, pers. comm.). There are approximately 109,000 acres of winter and seasonal mule deer habitat in the Battle Creek Allotment (Map 22). Good condition winter habitat is the most critical factor in maintaining the health and productivity of mule deer populations in this allotment.

- Ecological Condition

Of the approximately 23,000 acres of general winter range located in the Battle Creek Allotment, 32% was in good, 49% in fair, and 12% in poor condition in 1980 (Table 39). Crucial winter habitat covered approximately 17,500 acres with 49% in good to excellent condition. Seasonal range in the allotment covered approximately 54,800 acres, 84% was rated in fair or good condition (Table 39).

- Browse Utilization

Browse are native shrubs that are available for consumption by both livestock and wildlife. Utilization of bitterbrush and mountain mahogany stands were evaluated.

Mule Deer Winter Range-- The Bruneau MFP has a browse utilization standard limiting livestock use of key shrub species such as bitterbrush in deer winter range to 30%. All mule deer wintering areas are located in late spring and late spring/summer livestock use areas with browse transects located in pastures 9, 10, 12 and 22 (Map 5).

Utilization of bitterbrush by both deer and livestock during 1994, 1996, and 1997 did not exceed 30%. Highest use (24%) occured in 1994 during the livestock use period (Table 40). The summer of 1994 was a low precipitation year and livestock switched to bitterbrush during the latter part of the grazing season. Use levels averaged 7% during the same period in 1997. In 1996, combined livestock and deer use was 6%, while use of bitterbrush in 1997 by livestock, but before deer use was 5%.

Utilization of perennial grasses by livestock in deer winter range was predominantly slight to light (Table 41). Carpenter et al. (1979) stated that grasses were a major dietary component of wintering deer, but availability was affected by snow depth. Mountain big sagebrush, due to its abundance, comprised a large part of deer winter diets, but bitterbrush was the preferred browse species (Trout and Thiessen 1973).

Mule Deer Seasonal Range-- The Bruneau MFP browse utilization standard for deer seasonal range is that the combined use by deer and cattle should not exceed 50% on key shrub species. Utilization levels for mountain mahogany and bitterbrush were well below this standard. Due to drought, greater use levels were observed in 1994 than other years. Browse utilization was examined in seasonal range in pastures 10, 12, 14, 15, and 20 (Map 5).

Utilization levels of mountain mahogany were greatest during livestock grazing, with 9% use in 1994 and 7% in 1997. Use by deer before livestock was 3% in 1994 (Table 40).

Bitterbrush use was greatest in 1994, averaging 26.7% after use by both livestock and deer, while their use averaged 4.7% in 1996 and 3.6% in 1997 (Table 40). Use by livestock was greatest in 1994, averaging 24.9%. In 1997, livestock use averaged only 4.3%. Utilization before livestock, but after deer use was 3.4-3.8% in 1994 and 1997 (Table 40). Utilization was greater for both shrubs and grasses in 1994, reflecting drier conditions.

Table 40. Average percent browse utilization for mountain mahogany and bitterbrush in mule deer winter and summer ranges during 1994, 1996 and 1997 in the Battle Creek Allotment. MFP objectives were met if the mean ± 95% confidence interval (CI) of utilization was less than the MFP standard.

Mule Deer Range	Browse Species	Year	Sample Period	Sites (n)	Mean ± CI[a]	MFP Standard % of use
Winter	Bitterbrush	96	After lvst/deer use	2	6.7	30
		97	After lvst/before deer	8	5.4 ± .80	30
		94	During lvst use	1	23.8	30
		97	During lvst use	3	7.4 ± 9.8	30
Seasonal	Mtn. Mahogany	96	After lvst/deer use	1	5.0	50
		97	After lvst/deer use	1	3.0	50
		94	Before lsvt/ deer	3	3.4 ± 3.7	50
		94	During lvst use	1	9.6	50
		97	During lvst. use	1	7.0	50
	Bitterbrush	94	After lvst/deer use	2	26.7	50
		96	After lvst/deer use	4	4.7 ± 2.8	50
		97	After lvst/deer use	10	3.6 ± 2.4	50
		94	Before lvst/ deer	4	3.4 ± 2.6	50
		97	Before lvst/ deer	4	3.8 ± 4.6	50
		94	During lvst use	3	24.9 ± 37.8	50
		97	During lvst use	5	4.3 ± 8.4	50

[a] CI not calculated for means for ≤ 2 sites.

Within deer seasonal ranges, use pattern-mapping indicated heaviest use of herbaceous plants occurred in late spring pastures (87% of these pastures were grazed to moderate levels) and late spring/summer pastures (30% of these pastures received severe use) (Table 41). Spring diets of deer were comprised mainly of grasses, but deer abruptly switched to browse such as snowberry during the summer (Trout and Thiessen 1973). Livestock consumed more browse in the summer after grasses cured, but switched back to grasses during late fall green-up. Browse continues to be the predominant forage for deer during fall months (Trout and Theissen 1973).

Table 41. Percent of acres of mule deer ranges with different levels of perennial grass utilization during livestock use periods.

Mule Deer Range	Forage Utilization Levels	Livestock Season of Use				
		Early Spring	Late Spring	Late Spring/ Summer	Summer	FFR
Winter [a]	No Use	2	7	37		
	Slight	98	41	7	17	
	Light		31	40	69	
	Moderate		21	16	13	
	Heavy	trace	trace		1	
	Severe					
Seasonal	No Use		2			
	Slight			36	38	11
	Light		7	12	42	46
	Moderate		87	21	18	4
	Heavy		1	1	1	1
	Severe		3	30	1	38

[a] Includes both crucial winter and winter ranges.

- Form Class

Form class is a description of the availability of a shrub to be eaten by deer and the amount of hedging of that plant. Growth form is influenced by past and present utilization and may differ among populations. Portions of plants over 5 feet above the ground are considered unavailable.

Deer Winter Range– In 1979, 92% of the bitterbrush plants (n = 50) surveyed were only partially available to wintering deer (Table 42). Forty-six percent of the plants that were partially available were severely hedged and only 2% that were entirely available, were also severely hedged.

Form class distributions of bitterbrush differed between 1979 and 1996 (Chi-square test, $P < 0.01$). In 1996, 97% of bitterbrush plants (n = 700) surveyed were fully available for use by wintering deer (Table 42) and 50% of plants were all available and had little or no hedging. In 1979, 46% of total plants were only partially available and had severe hedging (Table 42). The 1996 data also suggest that livestock were utilizing perennial grasses rather than browse in the spring because 52% of bitterbrush plants had little or no hedging. The surveys indicated a shift to a younger age stand in 1996 compared to 1979.

Table 42. Percentage of bitterbrush shrubs in deer winter range in each form class (resulting from browse use by cattle and deer) in the Battle Creek Allotment.

Form Class	% of Plants Sampled	
	1979	1996 [a]
1. All available, little or no hedging	0	50
2. All available, moderate hedging	0	34
3. All available, severely hedged	2	13
4. Partially available, little or no hedging	4	2
5. Partially available, moderate hedging	42	<1
6. Partially available, severely hedged	46	<1
7. Unavailable	0	0
8. Dead	6	<1

[a] Combined data from 1994, 1996, 1997

Deer Seasonal Range– Form class distributions of bitterbrush in seasonal range differed between 1979 and 1996 (Chi-square test, $P < 0.01$). Seventy-six percent of bitterbrush plants (n = 300) were only partially available for use in deer seasonal habitat and 53% of all plants were severely hedged in 1979 (Table 43). Conversely, 5% of the plants (n = 1,400) in 1996 were partially available and 43% of all plants were severely hedged.

Table 43. Percentage of bitterbrush and mountain mahogany plants in deer seasonal range in each form class (form of shrub resulting from browse use by cattle and deer) in the Battle Creek Allotment, 1979 and 1996.

Form Class [a]	% of Sampled Bitterbrush Plants		% of Sampled Mountain Mahogany Plants	
	1979	1996 [b]	1979	1996 [b]
1	5	7	2	1
2	8	46	9	15
3	7	42	9	32
4	3	1	2	16
5	27	3	32	19
6	46	1	33	8
7	1	0	10	1
8	3	0	3	8

[a] See Table 42 for form class descriptions.
[b] Combined data from 1994, 1996, 1997

The number of bitterbrush plants in seasonal deer range that were moderately to severely hedged was greater than in winter ranges. Only 7% of plants in seasonal range showed little to no hedging (Table 43). In 1996, levels of hedging of available bitterbrush plants in late spring and late spring/summer grazing pastures approached those observed in summer pastures. Twenty-seven percent of plants in late spring pastures were severely hedged, while 29% were severely hedged in late spring/summer pastures (Table 44). In summer pastures, 38% were severely hedged and 54% were moderately hedged.

Form class distributions of mountain mahogany in deer seasonal range also differed between 1979 and 1996 (Chi-square test, $P < 0.01$). In 1979, 67% of the mountain mahogany plants (n = 150) were partially available for use with 42% of all plants severely hedged (Table 43). In 1996, 43% of available plants (n = 306) were partially available, with 40% of all plants severely hedged.

Mountain mahogany plants located in the livestock summer pastures were more severely hedged than in late spring pastures with all plants moderately to severely hedged (Table 45). In 1996, summer pastures had 62% young plants that were all available, but 50% of these plants were severely hedged. Fifty-two percent of the plants in the late spring pastures were all available with 31% severely hedged. Late spring pastures also had a higher percentage (46%) of plants that were only partially available. Because mountain mahogany naturally grows in a tree form, as plants grow older and get taller, more of each plant becomes unavailable for use by either deer or livestock.

Table 44. Percentage of bitterbrush plants by form class in seasonal pastures.

Form Class[a]	Late Spring		Late Spring/ Summer		Summer		FFR	
	1979	1996[b]	1979	1996[b]	1979	1996[b]	1979	1996[b]
1	7	33	0	33	3	6	-	0
2	5	35	0	31	9	54	-	43
3	6	27	0	29	8	38	-	51
4	2	2	8	2	3	<1	-	0
5	27	2	60	5	28	2	-	2
6	50	<1	28	1	46	<1	-	4
7	0	0	0	0	<1	0	-	0
8	2	<1	4	0	4	0	-	0

[a] See Table 42 for form class description.
[b] Combined data for 1994, 1996, 1997.

Table 45. Percentage of mountain mahogany plants by form class in seasonal pastures.

Form Class[a]	Late Spring		Summer		FFR	
	1979	1996[b]	1979	1996[b]	1979	1996[b]
1	4	<1	0	0	0	0
2	6	21	12	12	4	4
3	4	31	13	50	8	31
4	6	21	0	0	0	8
5	30	18	32	38	36	19
6	38	7	24	0	52	11
7	8	2	15	0	0	0
8	4	1	4	0	0	27

[a] See Table 42 for form class description.
[b] Combined data for 1994, 1996, 1997

- Age Class of Browse Plants

Age class data reflect the establishment, survival, age distribution, and decadence of key browse plants. These data will also reflect the health, recruitment, and reproduction of a population.

Deer Winter Range– Age classes of bitterbrush plants differed between 1979 and 1996 (Chi-square test, $P < 0.001$). Eighty-six percent of plants surveyed in 1979 were dead or decadent (Table 46). Conversely, 85% of the plants surveyed in 1996 were live mature plants while only 5% were dead or decadent. Ten percent of the 1996 populations surveyed were young or seedlings. Despite little reproduction in 1979, the population was healthy in 1996 with production and recruitment occurring in the stand. The age class data also suggested a shift to a younger age stand.

Table 46. Percentage of bitterbrush plants in deer winter range in each age class in the Battle Creek Allotment.

Age Class	% of Total Plants Sampled	
	1979	1996[a]
Seedling	0	1
Young (basal stem diameter < 0.5 in.)	2	9
Mature (basal stem diameter > 0.5 in.)	12	85
Decadent (> 50% canopy dead)	86	5

[a] Combines data from 1994, 1996, 1997.

Deer Seasonal Range– In 1979, 67% of bitterbrush stands consisted of decadent plants and only 19% of the population consisted of mature plants (Table 47). In the 1996, 82% of the plants were mature and 2% were decadent. This indicated a shift to a younger aged population with a higher percentage actively sustaining the shrub component.

Table 47. Percentage of bitterbrush and mountain mahogany plants in deer seasonal range in each age class, Battle Creek Allotment.

Age Class	% of Bitterbrush Plants Sampled		% of Mtn. Mahogany Plants Sampled	
	1979	1996[a]	1979	1996[a]
Seedling	4	3	8	2
Young (basal stem diameter < 0.5 in.)	10	13	19	13
Mature (basal stem diameter > 0.5 in.)	19	82	52	70
Decadent (> 50% canopy dead)	67	2	21	15

[a] Combines data from 1994, 1996, 1997.

Bitterbrush populations surveyed in 1979 in the late spring/summer grazing period had no reproduction and 88% of the stand was dead or decadent (Table 48). By 1996, an improvement in the age structure of the population had occurred with only 7% evaluated as decadent. Other pastures also exhibited the same type improvement with all populations dominated by mature plants. Plant reproduction and recruitment occurred between 1979 and 1996 to replace decadent plants.

Table 48. Percentage of bitterbrush plants by age class in seasonal pastures, Battle Creek Allotment.

Age Class	Late Spring		Late Spring/ Summer		Summer		FFR	
	1979	1996[a]	1979	1996[a]	1979	1996[a]	1979	1996[a]
Seedling	7	1	0	3	2	3	-	10
Young	14	13	0	9	8	8	-	25
Mature	21	82	12	81	17	87	-	61
Decadent	58	4	88	7	74	2	-	4

[a] Combines data from 1994, 1996, 1997.

Mountain mahogany populations did not show as much improvement in age structure as the bitterbrush populations between 1979 and 1996. A higher percentage (70%) of mature plants were surveyed in 1996, but a higher percentage of seedlings and young plants (27%) were surveyed in 1979 than 1996 (15%) (Table 49). Loss of reproduction and recruitment was evident in late spring pastures with 42% of the plants evaluated as seedlings or young in 1979 compared to 9% reported in 1996 (Table 49). There were no decadent plants in FFR pastures in 1979, but 14% were reported in 1996. Mountain mahogany populations showed improvement from 1979 to 1996, however, since this species is very long-lived, recruitment and reproduction does not occur at the same rate as observed for bitterbrush populations.

Table 49. Percentage of mountain mahogany plants by age class in seasonal pastures, Battle Creek Allotment.

Age Class	Late Spring		Late Spring/ Summer		Summer		FFR	
	1979	1996	1979	1996	1979	1996	1979	1996
Seedling	22	0	-	-	1	13	0	6
Young	20	9	-	-	21	0	12	23
Mature	28	75	-	-	56	75	88	57
Decadent	30	16	-	-	21	12	0	14

[a] Combines data from 1994, 1996, 1997.

Summary

Browse surveys indicated that livestock did not select for either bitterbrush or mountain mahogany in any of the grazing periods, nor in either deer winter or seasonal ranges. Use by livestock of shrubs in deer winter range was highest in 1994 (23%), but still below the standard of 30% set in the MFP. Highest use of shrubs in deer seasonal range also occurred in 1994, but averaged less than the MFP standard of 50%. Within deer winter ranges, greatest use of herbaceous plants by livestock occurred in late spring pastures with 21% of those pastures receiving moderate use. Within seasonal ranges, 90% of late spring pastures had moderate to severe use on herbaceous plants. Use on bitterbrush plants did not appear to be correlated with use of herbaceous plants. In areas where grasses were moderately used, little use was made on shrubs.

In winter range, health of bitterbrush populations showed marked improvement between 1979 and 1996. In 1979, 92% of available bitterbrush plants were only partially available for use by mule deer or livestock while in 1996, 96% were fully available for use. In 1996, only 15% of available plants in winter range were severely hedged and 50% had little or no hedging. Conversely, in 1979, 48% of available plants were severely hedged. In 1979, only 2% of plants were all available for use, while in 1996, 96% were all available. This indicated that recruitment and reproduction were occurring within bitterbrush stands.

In seasonal ranges, more forage became available in both bitterbrush and mountain mahogany stands. In 1979, 76% of bitterbrush plants and 67% of mountain mahogany plants were partially available for use. In 1996, 95% of bitterbrush plants and 48% of mountain mahogany plants were all available for use. However, the amount of moderate to severely hedged shrubs was unchanged between 1979 and 1996. In 1979, 53% of bitterbrush plants were severely hedged; 42% of mountain mahogany were severely hedged. Forty-three percent of bitterbrush and 40% of mountain mahogany plants were severely hedged in 1996. The static trend in the amount of moderate to severely hedged bitterbrush between 1979 and 1996 suggested that greater livestock use occurred sometime prior to 1994-97 (when utilization was < 25%). Form class data suggested that use in summer and FFR pastures was more extensive for both species than in late spring or late spring/summer pastures. This indicated a shift to more use on shrubs after curing of perennial grasses.

Outbreaks of tent caterpillars were observed in bitterbrush stands in 1997-98. Tent caterpillars are a natural predator of bitterbrush. Plants in good condition can recover from periodic defoliation, whereas defoliation may cause mortality in stressed plants. Moderate to severe hedging, especially during drought conditions may cause stress in bitterbrush.

Both bitterbrush and mountain mahogany showed evidence of recruitment and rejuvenation of decadent plants in the populations surveyed. Overall, more seedlings and young plants were available for recruitment into stands in 1996 compared to 1979. Bitterbrush populations showed the greatest improvement in late spring/summer pastures where 88% of plants surveyed in 1979 were decadent compared to 6.5% in 1996. Mountain mahogany populations in FFR pastures showed the least improvement with an increase in percentage of decadent plants in 1996. However, this was offset by increased numbers of seedlings and young plants in other pastures. Overall, surveys indicated that both bitterbrush and mountain mahogany populations were healthy and reproduction and recruitment was occurring. Mountain mahogany grows into a tree form, which accounts for more of the plants being unavailable for use. They are also very long-lived with some plants over 100 years old. Juniper encroachment may also have affected recruitment in mountain mahogany stands. As seedlings of both species become established, mahogany seedlings are browsed, while unpalatable juniper seedlings are not browsed. Root competition from maturing junipers inhibits establishment of mahogany seedlings.

Pronghorn

Pronghorn are distributed throughout the allotment at densities of approximately 5 animals /square mile (L.Nelson, IDFG, pers. comm). There are approximately 59,800 acres of seasonal range and 46,200 acres of winter range (Map 21). Presently, the population is considered stable to increasing. The higher elevation portion of the allotment is summer and fall range with some of the population wintering in the lakebed area in pasture 21.

As stated in the Bruneau MFP, pronghorn habitat is managed for good ecological condition. Principle pronghorn forage consists of browse species (low sagebrush in particular) throughout the year. The greatest use of grasses and forbs occurs during spring and summer with native species such as bitterbrush, balsamroot, lupine and penstemon supplementing the staple sagebrush diet.

- Ecological Condition

The major portion of pronghorn winter range in the Battle Creek Allotment was found in pasture 21 (Map 5). There were approximately 46,200 acres of winter range in the allotment. Sixty-five percent of this range was rated in poor condition and 21% was rated in fair condition by the updated 1980 ESI (Table 39). Trend in condition of pronghorn winter range was static.

Seasonal range in the allotment covered approximately 59,800 acres (Map 21). The updated 1980 ESI for seasonal range indicated that 50% was in fair condition and 12% was in poor condition. The Bruneau MFP objective RM 1.1(3) stated that grazing management will be designed to improve the condition of crucial pronghorn habitat.

c. Upland game

Sage grouse are the most important upland gamebird species in the Battle Creek Allotment. Chukars and California quail are also present. Their habitat conditions are closely tied to riparian area conditions.

Sage Grouse

Sage grouse are a very habitat-specific species depending on sagebrush/grassland ecotypes to meet most of their life requirements. Approximately 64,000 acres of sage grouse habitat were identified in the Battle Creek Allotment (Map 23). Sage grouse populations in Idaho are presently at record lows and lek surveys are indicating dramatic downward trends (ISGMP 1997). Factors affecting population dynamics include habitat loss, degradation, and fragmentation, and recent cool/wet spring weather patterns (ISGMP 1997, Willis et al. 1993). The past drought may have also affected spring insect populations which comprise 90% of the diet of newly hatched chicks during brood rearing.

- Leks

Sage grouse leks or breeding grounds are usually open areas with little or no vegetation. Males arrive on the same leks every spring, set up territories, vocalize, and strut to attract females. Seven historic leks were identified in the MFP for the Battle Creek Allotment (Map 23). Four leks were found active and were monitored during 1996 and 1997. Surveys were conducted in the spring and counts varied between 5 to 29 birds per lek.

- Nesting Habitat

Bruneau MFP objective WL 4.4(1) states that nesting habitat will be managed for good ecological condition. Sage grouse are dependent on large acreages of sagebrush/grassland habitats with a 15-25% canopy cover as well as good grass/forb understory (ISGMP 1997). The Bruneau MFP objective WL 4.4(2a) states that canopy cover in nesting habitats must be maintained at 20-30%.

Twenty-nine percent of sage grouse nesting habitat was rated in good to excellent condition and 43% in fair by the updated 1980 ESI (Table 50). Ten percent of the habitat was either burned or unrated. Late spring pastures contain 52% of the nesting habitat in the allotment. Sixty percent of this habitat was rated in fair and 34% in good or excellent condition. In 1980 late spring/summer pastures had the greatest percentage of habitat in poor condition, with 31% (Table 50). In summer pastures, 29% of nesting habitat was in poor condition. Since 1980, trend in nesting habitat was static to upward for bluebunch wheatgrass and static for other grasses and forbs.

The ISGMP (1997) states that nesting habitat should have 15 to 25% sagebrush canopy cover and 7 inches of grass and forb understory during the May nesting period. Delong et al. (1995) stated that height of grasses (≥ 7 inches) was very important for visually shielding sage grouse nests from ground predators. Livestock utilization levels indicated that 71% of nesting habitat had no more than light use while 22% was moderate to severe use (Table 51). Visual screening to protect nests may be adequate in nesting habitat in early spring pastures where slight to light use was documented. Sagebrush dominates most of the allotment, but desirable understory species may not be dense enough to prevent ground predators from detecting nesting hens in areas rated in poor ecological condition in 1980 with a static trend.

- Brood Rearing Habitat

Bruneau MFP objectives state that brood rearing habitats will be managed for good ecological condition and for sagebrush areas, a canopy cover of at least 20%. In Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management, Standard 2 calls for wetlands to be managed for properly functioning condition.

In Idaho, meadows provide critical habitat as brood rearing areas for sage grouse (Autenrieth 1981). Meadows and seeps provide a source of food (forbs, insects) and water that are unavailable on adjacent, more xeric rangelands (Savage 1969, Call and Maser 1985, Gregg et al. 1993, Drut et al. 1994). These wet meadows provide habitat for insect populations, which make up 90% of the diet of sage grouse during the first two weeks after hatching. Primary brood rearing habitat (semi-wet meadows, riparian areas, and basin mountain big sagebrush communities) was mainly located in summer pastures (Map 23).

Table 50. Ecological condition of sage grouse wintering and nesting habitat, from updated 1980 condition survey, Battle Creek Allotment.

Season of Use	Condition Class (acres)			Totals
	Condition	Sage Grouse Winter Habitat	Sage Grouse Nesting Habitat	
Ungrazed	Poor	23	17	40
	Fair	1045	285	1330
	Good	1	1	2
	Unrated	637	44	681
Early Spring	Poor	3	326	329
	Fair	998	1681	2679
	Good	157	236	393
	Burned	21	21	42
Late Spring	Poor	901	685	1586
	Fair	12891	12853	25744
	Good	5835	6808	12643
	Excellent	322	360	682
	Burned	270	635	905
	Unrated	4		4
Late Spring/ Summer	Poor		1203	1203
	Fair		1832	1832
	Good		331	331
	Unrated		499	499
Summer	Poor		2876	2876
	Fair	151	2531	2682
	Good	24	3973	3997
	Burned		387	387
	Unrated		243	243
FFR	Poor		389	389
	Fair		16	16
	Good		151	151
	Burned		810	810
	Unrated		1542	1542
Total		23283	40735	64018

[1] Private lands, lands excluded from grazing, or lands not use pattern mapped.

Table 51. Livestock utilization levels by season of use in known sage grouse nesting habitat, based on 1992-1997 use pattern maps, Battle Creek Allotment.

Season of Use	Livestock Utilization Levels (acres)						Total by Season of Use
	No Use	Slight	Light	Moderate	Heavy	Unrated[a]	
Early Spring	53	2210					2263
Late Spring	1,275	6823	7065	6009	4	163	21340
Late Spring/ Summer		2098	361	123	7	1588	4176
Summer		3072	4192	2281	390	76	10011
No Season							347
FFR	544	268	1063	88	36	909	2908
Total	1872	14471	12681	8501	437	2736	41045
Percent by Level	5	35	31	21	1	7	

[a] Private lands, lands excluded from grazing, or lands not use pattern mapped.

In 1997, 35% of the meadows surveyed had a four-inch stubble height at the end of the growing season (Table 52). Forty-five percent of the wet meadows surveyed were associated with reservoirs. These areas have a tendency to be over-utilized due to their close proximity to water. Trend in upland areas adjacent to wet meadows along Dry Creek was static to upward for bluebunch wheatgrass and static for other grasses and forbs.

- Intensive Meadow Sampling

Site Classification - Soil

Soil features of the Dry Creek meadows were within the range observed for mountain meadow ecological types in Nevada, except for being generally warmer than higher-elevation Nevada sites (Table 53). Generally, dark surface-soil colors in all three profiles (0 to 24 inches) result from organic matter accumulations that typify soils of the order Mollisols. Dry Creek meadows range from drier (site 001) to very moist (site 003) as indicated by July (1998) depths to saturation and depths to mottles (Table 53). On the wettest site (003), gray chromas (Munsell soil color) below a depth of 4 inches suggest extended periods of water saturation and oxygen depletion. The relative degrees of soil wetness and the persistence of water tables during summer influence the classification of the meadow soils into suborders: Aquolls (mollisols with persistently high water table levels and oxygen depletion) and Xerolls (undrained mollisols that lack soil saturation for most of the summer).

Table 52. Levels of residual vegetation after livestock use on wet meadows in pastures, Battle Creek Allotment, 1995, 1997.

Pasture	Legal Description	Date Surveyed	Stubble Height (inches)	Comments[a]
10	09S02E13NWSW	10/18/97	0	Tigert Spr.
12	08S01E33NWNW	10/07/97	1.5 - 3	Reservoir/meadow
14	09S01E11NWSE	10/07/97	1.5 - 2	Reservoir/meadow
15	09S01E31NENE	10/18/97	2 - 3	Wet meadow
	09S02E28SWSE	10/18/97	4 - 5	Wet meadow
20	09S01W14SWNW	11/18/97	1 - 1.5	Wet meadow
	09S01E31NENW	11/18/97	4 - 6	Antelope Flat Res.
	09S01E20SWSE	11/18/97	1 - 1.5	Reservoir/meadow
	09S01E22SESW	9/25/95	3-4	Seep
	09S01E27SWNEa	9/25/95	2-3	Seep
	09S01E27SWNEb	9/25/95	1-4	Seep
	09S01E29NWNE	11/18/97	1 - 1.5	Wet meadow
	10S01W02NENE	11/18/97	1 - 1.5	Reservoir/meadow
	10S01W02SENW	11/18/97	4 - 6	Dry Creek
	10S01W03NESE	11/18/97	4 -5	Wet meadow
	10S01W11SESW	8/8/95	10-30	Seep
	10S01W12NWNE	11/18/97	4 - 6	Spring/meadow
	10S01E07NWSE	11/18/97	4 - 10	Dry Creek Reservoir
	09S01E27NWNE	11/29/97	3 - 4	Hutch Springs
	10S01E17NESW	11/29/97	1 - 2	Spring/meadow
	09S01E17NESE	11/29/97	1 - 1.5	Wet meadow
22	09S02E05SWSW	10/08/97	2 - 3	Reservoir/meadow
	08S02E27NWNE	10/08/97	4 - 5	Reservoir/meadow
	08S02E35NWSW	10/08/97	3 - 4	Reservoir/meadow
	08S02E28SESW	10/08/97	4 - 5	Wet meadow

[a] Reservoirs and spring projects associated with wet meadows were built before implementation of the MFP.

Shallow mottles in the drier Dry Creek meadows (001 and 002) represent distinctive iron oxide accumulations around fine root pores. Evidently, even in the dry meadows, there are times during the growing season when oxygen is generally limiting in the surface soil, except near roots. Wetland plant roots are noted for carrying oxygen into otherwise oxygen deficient, saturated soil and for forming iron oxide (rust) concentrations - root mottles (Fisher and Stone 1991). Because mottles persist in drained soils, the mottles observed in the drier meadows are probably indicators of fluctuating water table levels. Cooler temperatures of the high elevation Nevada meadow sites would decrease the early-season processes of iron reduction and oxidation and might explain the lack of shallow mottling on drier sites (Table 53).

Site Classification - Vegetation

The plant communities of the Dry Creek meadows are similar in composition to grazing-induced disturbance states of the Nevada mountain meadow ecological types shown in Table 53 (Weixelmanet al. 1996). Livestock trampling and soil compaction are the typical disturbances found on both the Nevada and Dry Creek meadows. Fifty-one plant species were identified in the Dry Creek meadow plots. Of those, 34 species were forbs, along with 15 species of grass or grass-like plants, and two shrub species. The majority of species (61%) were characterized as increasers, whereas 12% were characterized as decreasers (Table 54). Seven species of forbs and three species of grass or grass-like plants were non-native. Species diversity increased as site wetness increased.

Baltic rush and Douglas sedge dominate the two drier Dry Creek meadow types (001 and 002) (Table 55). Baltic rush is a resilient increaser under livestock grazing as is Douglas sedge. The latter is noted for tolerance to dry, heavily compacted sites on fine-textured soils (Manning and Padgett 1995). Similarity to a Dry Graminoid - Cryoboroll - Trough drainageway ecological type (e.t.) with wetter inclusions of a Mesic Graminoid - Aquic Cryoboroll - Trough drainageway e.t (wet swale area of 002) suggests that the potential natural communities of these sites would be dominated by more palatable graminoids (Weixelman et al. 1997).

The following plant species increase in dominance with disturbance in both Nevada meadows and the Dry Creek meadows (Table 55): redtop bentgrass, meadow foxtail , Kentucky bluegrass and herb species such as aster (*Aster* spp), dandelion, iris, cinquefoil (*Potentilla gracilis*), yarrow and clover. Palatable grasses and grasslikes such as Nevada bluegrass (*Poa secunda* ssp. *juncifolia*) (not identified on Dry Creek meadows), mat muhly and Nebraska sedge decrease with disturbance. Mat muhly is only a minor cover component of the drier Dry Creek meadows.

Dry Creek meadow 003, is similar to an early to mid-seral stage of the *Carex nebrascensis* - Cryaquoll - Trough floodplain ecological type (Weixelman et al. 1996), with Nebraska sedge a relatively minor cover component. Meadow foxtail, which dominates the saturated unchannelized wetland of Dry Creek meadow 002, is a pioneer species that also dominates early seral stages of the *Carex nebrascensis* - Cryaquoll - Trough floodplain e.t. in Nevada.

Table 53. Landscape and soil characteristics of Dry Creek meadows, Battle Creek Allotment compared with the same characteristics of selected Nevada mountain meadow ecological types.

Site	Landform	Community Types[a]	Soil Sub-order	Depth to Saturation (inches)	Depth to Mottles (inches)	Depth to 20% Coarse Fragments (inches)
Dry Creek Meadows - Not Incised						
001	trough drainage way with seep	Douglas sedge (*Carex douglasii*.)	Xeroll	>36	approx. 4	36
002	trough drainage way with seep and unchannelized linear wetland	1.Baltic rush (*Juncus balticus*) 2. Douglas sedge	Xeroll/ Aquoll[b]	20-24	approx. 4	24
003	floodplain	Kentucky bluegrass	Aquoll	12	approx. 12	>44
Selected Nevada Mountain Meadow Ecological Types (e.t.)[c]						
Nevada - 1	trough drainageway	Dry graminoid e.t.	Xeroll	>40	35(7)	33(10)
Nevada -3	floodplain	Mesic graminoid e.t.	Boroll	37(11)[d]	22(13)	34(11)
Nevada - 4	floodplain	Nebraska sedge e.t.	Aquoll	11(8)	14(13)	26(13)

[a] Community types (c.t.) described by Manning and Padgett 1995. Douglas sedge c.t., Baltic rush c.t., Kentucky bluegrass c.t.

[b] A distinct soil moisture gradient is present on the site.

[c] Ecological types described by Weixelman and others 1997: **Dry graminoid type** including Douglas sedge, Nevada bluegrass (*Poa secunda* ssp. *juncifolia*) and mat muhly (*Muhlenbergia richardsonis*); **Mesic graminoid type** including Baltic rush, Kentucky bluegrass, Nevada bluegrass, Douglas sedge , Nebraska sedge (*Carex nebrascensis*); **Nebraska sedge type** including Baltic rush, Nebraska sedge , and Kentucky bluegrass.

[d] represents mean depth (standard deviation)

Table 54. Meadow vegetation inventory results for three sites on Dry Creek, Battle Creek Allotment, July 1998.

Site[a]	Number of species	# species of >1% cover	% Increaser species[b]
001	21	12	83
002	24	14	64
003	48	17	71

[a] WMBAT001 = 09S01W35NWSE; WMBAT002 = 09S01W35SWSE; WMBAT003 = 10S01W01SESW

[b] Percent of classes >1% cover.

Table 55. Plant species and percent cover classes on vegetation plots on meadows adjacent to Dry Creek, July 1998, Battle Creek Allotment.

Percent Cover	Site		
	Meadow 001	Meadow 002	Meadow 003
60-69%	Baltic rush		Kentucky bluegrass
40-49%	Douglas sedge	Baltic rush	
20-29%		meadow foxtail (*Alopecuris aequalis*); Douglas sedge	
11-19%	dandelion (*Taraxacum officinale*); Kentucky bluegrass	dandelion; mat muhly (*Muhlenbergia richardsonis*); Kentucky bluegrass	Baltic rush; cinquefoil (*Potentilla gracilis*)
6-10%	redtop bentgrass (*Agrostis stolonifera*); meadow barley (*Hordeum brachyantherum*); aster (*Aster chilensis. ascendens)*	aster (*Aster c. ascendens);* rush (*Juncus orthophyllus)*	Nebraska sedge; dandelion; yarrow (*Achillea millefolium)*; aster (*Aster c. ascendens*); iris (*Iris missouriensis);* *Antennaria microphilla*
1-5%	mat muhly; *Antennaria microphilla*; *Arnica chamissonis*; cinquefoil (*P. biennis; P. gracilis*)	redtop bentgrass (*Agrostis stolonifera*); meadow barley; *Arnica chamissonis;* *Potentilla gracilis;* *Mimulus glabratus;* *Montia chamissoi*	Douglas sedge; *Carex* sp.; spike rush (*Eleocharis palustris*); *Glyceria* sp.; rush (*Juncus orthophyllus*); clover (*Trifolium pratense*); Camassia quamash; silver sage (*Artemisia cana*)

Utilization

End-of-growing-season stubble heights (September 1998) varied from 1 to 12 inches with the level of utilization increasing as site wetness increased (Table yyy). There was very patchy use of baltic rush on the driest site (001) with 30 to 45% of the area grazed to less than two inches stubble height and the remaining ungrazed rush standing to twelve inches height. Meadow foxtail and baltic rush growing in and near the saturated zones of site 002 received heavy to severe utilization. Douglas sedge and mat muhly were obviously utilized, although tall growth of baltic rush remained on the dry parts of the plot. Nebraska sedge, a palatable decreaser, generally received heavy to severe use. This was most obvious on the wettest site, 003 where over 95% of the plot received heavy to severe utilization.

Table 56. Functioning condition assessment (June 1998) and end-of-season stubble heights (September 1998) for Dry Creek wet meadows, Battle Creek Allotment.

Site	Stubble Height	Functioning Condition	Trend
001	2-12"	FAR[a]	D[b]
002	2-3"	FAR	D
003	1-8"	FAR	D

[a] FAR = Functional - At Risk

[a] Trend for Functional - At Risk sites: D = downward

Functioning Condition Assessment

The strong similarity of the Dry Creek meadow landscape, soils, soil moisture regimes, and vegetation to some of the Nevada mountain meadow ecological types gives a basis for evaluating the capability and potential of the Dry Creek meadows against those types. Each of the three sites was assessed as functioning-at-risk with downward trend (Table 56), because of soil disturbances, the early-seral vegetation composition, and the trends in bare ground and amount of channelization indicated by aerial photography.

The following 5 ecological parameters, which form a portion of the standard checklist for assessing condition of lentic wetlands (USDI 1994) were the primary factors contributing to the meadows being evaluated as functional at risk:

Riparian-wetland zones are not enlarging or have not achieved potential extent, based primarily on analysis of 1976 and 1991 aerial photographs. The 1976 photos represent a moist to normal precipitation year, whereas the 1991 photos illustrate the effects of severe drought. Vastly greater bare ground reflectance occurs in the later photos, suggesting the complete removal of vegetation from the wettest soil areas in the dry meadows (001 and 002) and high utilization and trampling impacts of the wetter meadow site (003). On-site observations through the summer of 1998 showed the same pattern of use and impact in a normal precipitation year. The long-term effects have resulted in loss of wetland zones around severely impacted seeps adjacent to the meadows and very likely promoted encroachment of sagebrush at the meadow margins (001 and 003).

Natural surface or subsurface flow patterns are altered by disturbance (i.e., hoof action). Soil disturbance is most evident in the drier trough-drainageway meadows (sites 001 and 002). These meadows naturally lack any definable channel. Where soils have been most heavily trampled, however, linear channel-like features have formed. Seasonally wet seeps on the toeslopes of the eastern ridge have completely lost shallow surface soil, leaving circular cobbly, almost barren features. Hoof imprints severely disturb the structure of wet soils around the seeps and in a saturated linear swale. Soil loss and disturbance is such that only weedy annual plants grow on these sites. In the drought years of the early 1990's, the zones of wettest soils were also mostly barren, as indicated by the high reflectance around and along the wet soil features in the June, 1991 aerial photos.

Soil compaction is a concern on the wettest, highest potential site 003 which is dominated by Kentucky bluegrass. These moist soils are not protected by the extraordinary root density that Nebraska sedge has (Manning et al. 1989), although the bluegrass sod is still intact at this time. Livestock walk down the channel, grazing on the Nebraska sedge that colonizes parts of the wetted edge and succulent baltic rush growth on the channel bottom. Banks are sheared at access points and are vertical where sheared by livestock hooves.

A diverse age-class distribution (for recruitment for maintenance or recovery) of riparian plants is not always present. In particular, excessively churned, saturated soils in the swale of meadow 002 lack sedge colonies and are almost completely dominated by meadow foxtail. Recovery of these areas might require planting of desired species. Because Baltic rush has such an aggressive rhizome system and has low palatability, the species composition of the two drier meadows which it dominates will probably be very slow to change.

Riparian-wetland plants do not exhibit high vigor. Decreaser species are often present as small, isolated colonies in contrast to the more extensive rhizomatous cover of less desirable plants.

Adequate vegetative cover is not present to protect shorelines/soil surface and dissipate energy during high wind and wave events or overland flows. By the end of grazing, there is very little cover on the wettest swale soils of meadow 002. There is little to no litter development on the dry meadows and short stubble except for lank baltic rush.

- Wintering Habitat

Sage grouse require dense stands (> 20% canopy-coverage) of sagebrush for food and cover during the winter (Call and Maser 1986). The majority of known sage grouse wintering areas in the Battle Creek Allotment occurred in early and late spring pastures (Map 23). In most wintering areas, low sagebrush was the dominant shrub and the main food source for wintering sage grouse.

There are approximately 23,000 acres of sage grouse wintering habitat in the Battle Creek Allotment. Approximately 93% of the winter range was rated in fair to excellent condition (Table 51). Most winter habitat was located in late spring pastures where only 4% of the area was rated in poor condition. Wintering sage grouse are dependent on sagebrush. A downward trend in ecological condition and an increase in sagebrush could actually enhance habitat quality for wintering sage grouse. Therefore, while the objective of good ecological condition was not met with 27% in good to excellent condition, the shrub component was still meeting the requirements of wintering sage grouse.

4. Sensitive Plant Species

Inventories for sensitive plants in the Battle Creek Allotment have primarily resulted from surveys associated with range or realty actions. No complete and thorough inventory of the allotment has been conducted. The allotment provides habitat for at least 10 special status plant species (Appendices H, I, Map 24), all of which are included on the BLM Sensitive Plant List. Sensitive plant species are known from 12 of the 23 pastures within the allotment (Appendix J). Seven of the ten species occur in salt desert shrub and Wyoming sagebrush habitats with soils derived from lakebed sediments. The remaining three occur in low and mountain big sagebrush communities.

Of the ten species known or expected to occur in the Battle Creek Allotment, Mulford's milkvetch and Mud Flat milkvetch are of particular concern because of their global rarity and presence in sites easily accessible to and frequented by livestock. While Mud Flat milkvetch is the most frequently occurring sensitive plant in the allotment, it is known only from Owyhee County and one site in northern Nevada. Mulford's milkvetch occurs in Ada, Owyhee, Payette, and Washington counties, Idaho and Malheur County, Oregon. Two other globally rare species occur either within the allotment or adjacent to it. These include Snake River milkvetch (*Astragalus purshii* v. *ophiogenes*), known from one site within the allotment, and Packard's buckwheat (*Eriogonum shockleyi* v. *packardae*), known from two adjacent areas. Little is known about the effect of livestock grazing on Snake River milkvetch, which is typically found in sandy soil types. Packard's buckwheat occurs on sparsely vegetated bluffs that are usually lightly frequented by livestock. However, where water has been developed in proximity to matted cowpie buckwheat (*Eriogonum shockleyi* v. *shockleyi*), a closely related variety which could also be present in the allotment, trampling of the plants and ground disturbance have resulted in an increase in cheatgrass in this habitat. Subsequent fires that have burned through the population have resulted in high mortality of the buckwheat. Prior to cheatgrass invasion, these sites probably did not burn due to the paucity of fuel. It is possible that the same situation could develop in Battle Creek. Other livestock associated actions that could concentrate use would be inappropriate placement of salt or mineral blocks and fences.

It is possible that livestock grazing, trampling, and improvement projects such as water troughs and pipelines have effected other special status plant populations in the allotment as well, but this is unknown because of incomplete inventories.

Mulford's milkvetch

- Distribution and ecology

Mulford's milkvetch (*Astragalus mulfordiae*) has not been found in the Battle Creek Allotment, but it occurs on either side of the allotment in very small numbers where habitat conditions are suitable. Thus, it might grow in this allotment. Mulford's milkvetch is a perennial species that grows on deep, sandy slopes and flats in shrub-steppe communities at relatively low elevations (2,000-3,600 feet). Mulford's milkvetch has decreased throughout much of its historic range due to declining habitat quality and the subsequent invasion of exotic plants such as cheatgrass and tumblemustard (Moseley 1989).

- Potential effects of livestock grazing

Livestock grazing has occurred historically at virtually all known Mulford's milkvetch locations in Idaho. Pyke (1996) documented livestock grazing of milkvetch plants in eastern Oregon. He recommended that livestock not be permitted to graze pastures occupied by Mulford's milkvetch during its active growing and flowering season. Livestock grazing of Mulford's milkvetch has been observed by others as well (Lichtardt 1995, J. Findley, BLM, pers. comm.). Indirect effects on the species due to livestock grazing are those associated with soil disturbance and subsequent increased competition with introduced annuals.

- Habitat conditions in the Battle Creek Allotment

As stated above, Mulford's milkvetch is not presently known from the allotment. If present, it would occur in the low elevation pastures, those that are either ungrazed, grazed in the winter or in the early-mid spring. Known populations in Castle Creek Allotment are adjacent to these pastures. Early to mid spring grazing has been shown to be detrimental to the species (Pyke 1996).

Mud Flat milkvetch

- Distribution and ecology

Mud Flat milkvetch (*Astragalus yoder-williamsii*) is a dwarf, tufted perennial found on rhyolitic gravel soils in mountain big sagebrush-Idaho fescue habitat, sometimes on the edge of the juniper zone. Within these habitats the milkvetch may occur in very low to high densities, with scattered clusters of plants being the common pattern. Populations range in size from areas less than one acre to being scattered over a few square miles, and support from less than ten to over 10,000 individuals (Mancuso and Moseley 1993).

Except for one disjunct population in the Osgood Mountains in Humboldt County, Nevada, Mud Flat milkvetch is restricted to the Owyhee Uplands of west-central Owyhee County, Idaho. It occurs from near Triangle to the upper Deep Creek drainage, mostly east to Battle Creek, and in the Pleasant Valley area about six miles from the Oregon state line (Mancuso and Moseley 1993).

- Potential effects of livestock grazing

Although the effect of grazing on the long-term viability of the species is unknown, the cumulative impacts of grazing management activities are thought to be the primary threat to the species (Mancuso and Moseley 1993). Several Mud Flat milkvetch populations have been impacted by range improvement project development and excessive livestock grazing (Mancuso and Moseley 1993). Because this species generally occurs in sites in better range condition than Mulford's milkvetch, most grazing associated impacts have been relatively localized. The most serious direct effect of livestock grazing throughout the species' range is trampling, particularly around areas of concentrated use, such as near water sources and salting areas. The plant's small size and low-growing stature probably limit the amount of grazing it receives, however plants uprooted by livestock trampling have been observed on several occasions, including the Battle Creek Allotment.

- Habitat conditions in the Battle Creek Allotment

Species typically associated with Mud Flat milkvetch include Idaho fescue, mountain big sagebrush, and bitterbrush. Areas dominated by these species are generally in static to downward range condition, but the long-term effect of this change on the milkvetch is unknown. However, loss of Mud Flat milkvetch plants has been documented within the allotment, i.e. during construction of a water development project at the Big Sagehen Reservoir (Mancuso and Moseley 1993).

American wood sage

- Distribution and ecology

American wood sage (*Teucrium canadense* var. *occidentale*) is a relatively large (to 2 feet), rhizomatous woody perennial belonging to the mint family. Its tubular flowers are pink to purple colored in a crowded raceme. The western variety (var. occidentale) is irregularly distributed in the western U.S. It is known from the Rocky Mountains and, in the Intermountain Region, from Ada, Canyon, Owyhee, and Washington counties, Idaho and north central Utah. Throughout Idaho, fewer than ten populations are known.

- Potential effects of livestock grazing

Livestock grazing effects on American wood sage are poorly known, however it can probably be assumed that the extensive grazing and trampling often present in riparian habitats would be adverse for the species. At least half and probably more of the known Idaho sites are ungrazed (Moseley 1998), which lends some support to this inference. Because the plant is large and showy, if it were common or occurred in heavily grazed habitats, it would likely be observed more often than it is.

- Habitat conditions in the Battle Creek Allotment

There are several large populations within the allotment along C.J. Strike Reservoir, a pasture that has been ungrazed for many years. Because habitat conditions required by the wood sage are still poorly understood and because little inventory data are available, it is unknown whether or not the species presence in this area is related to the lack of livestock grazing. Additional American wood sage populations have not been found to date within the Battle Creek Allotment, however no inventory has been conducted in the riparian areas for this species.

Summary

The effect of livestock grazing on many of the plants is poorly known due to the lack of monitoring data, individual species studies, and limited distribution information. Of the ten species, all but one have a perennial life form. White-margined wax plant (*Glyptopleura marginata*) is the only annual presently known to occur within the allotment, but others such as white eatonella (*Eatonella nivea*) and rigid threadbush (*Nemacladus rigidus*) could be found. They are known from an adjacent allotment (Castle Creek). Their small size and short life cycle make them impossible to locate for most of the year. Two of the perennial species, Mulford's milkvetch and Mud Flat milkvetch, are former federal candidates for listing as threatened or endangered. Both are of particular concern due to their limited distribution and potential conflicts with livestock grazing and associated range developments. American wood sage is of concern because it typically grows in riparian areas.

Little Jacks Research Natural Area

The Little Jacks Creek Research Natural Area (RNA) was designated in the 1983 Bruneau MFP. This 1,920-acre area is located on the plateau south of the confluence of Rattlesnake and Little Jacks Creeks (Map 25). The RNA was selected for its four major habitat types in excellent range condition (Caicco and Wellner 1983). Three of the habitat types occur on the plateau which is encircled on all but the south side by the canyons of Little Jacks and Rattlesnake creeks. These three habitat types include:

Wyoming sagebrush/Bluebunch wheatgrass;
Low sagebrush/Bluebunch wheatgrass; and
Low sagebrush/Sandberg bluegrass.

The fourth habitat, the Basin big sagebrush/Idaho fescue type, occurs on north- and northwest-facing slopes of Rattlesnake Creek canyon. It also occurs in similar locations along the canyon walls of Little Jacks Creek. A well developed riparian zone along the bottom of the canyon is dominated by arroyo willow (*Salix lasiolepsis*), red-twig dogwood (*Cornus sericea*), choke cherry, currants (*Ribes* sp.), and Great Basin wildrye (*Elymus cinereus*). This riparian zone is in excellent condition overall (Caicco and Wellner 1983). The creek bottom was last grazed in the 1970's, except for occasional trespass use.

A number of species are restricted to the rocky cliffs, ledges, and slopes of the canyon walls, two of which are regional endemics. These include Bailey's ivesia (*Ivesia baileyi*) and Packard's mugwort (*Artemisia packardiae*).

Several factors have been responsible for the preservation of high quality range types in the RNA (Caicco and Wellner 1983). The plateau lies several miles from the nearest accessible water source. The canyon walls are steep and interrupted by 100 foot high vertical cliffs in some places. Boulder fields and unstable talus slopes are a common occurrence. Access in the canyon bottom has in the past been limited both upstream (by a boulder-dominated stream reach) and downstream (by dense areas of riparian shrubs) (Caicco and Wellner 1983).

For these reasons, Bruneau MFP decision R-1.1(4e) states: "Manage and protect this area for a Research Natural Area. Fence to exclude livestock if necessary to protect RNA values." Objective RM-1.4 states "the establishment of the Research Natural Area (RNA) was recommended by the Advisory Council. It was the intention of the council that the area be protected from livestock grazing and would be fenced off to exclude livestock if necessary. The RNA can be used as a scientific control site to compare the impacts of livestock grazing vs. no livestock grazing on the same ecological site." A fence was constructed in 1976 across the lower end of Little Jacks Creek canyon to prevent livestock access to riparian plant communities in the canyon bottom. Because of a lack of available water, upland areas within the RNA generally receive no to slight livestock use.

5. Cultural Resources

Information regarding distribution of cultural sites is incomplete for the Battle Creek Allotment. However, in general, site density was medium to high in the higher elevations of the allotment. This corresponds with the findings in the Class II Inventory (Young 1984). Site density is low in the lower elevations with the exception of the riverine areas along the Snake River.

Thirty-five sites and 26 isolated finds were recorded in the Battle Creek Allotment. Additionally, four sites were noted on BLM cultural map overlays but had not been recorded. The site types were categorized as follows:

Native American Sites and Isolated Finds - 51
Historic Sites - 7
Historic Structures - 2
Composite Sites - 1

Sites noted but not recorded included two Historic structures and two Native American sites.

The MFP identified 10-OE-2256 and associated sites and the South Alternate of the Oregon Trail as eligible for inclusion in the National Register of Historic Places.

Potential effects of livestock grazing

Direct and indirect impacts to cultural resources result from grazing on open range. Grazing practices which could adversely effect cultural resources include watering livestock at reservoirs, troughs, creeks and springs, trailing along fences or established trails and congregating at salt licks, as well as fence construction and maintenance, plowing and seeding projects, pipeline construction, and spring improvements. Sites located at springs are particularly vulnerable to grazing impacts, especially if there are developments at the spring. Without protective measures, such as fencing, scientific information at these locations may be lost.

Direct impacts from grazing include surface disturbance, soil compaction, and consequent damage to and repositioning of artifacts through trampling. The degree and rate of site destruction in relation to the duration of trampling or number of livestock is unknown. In addition to artifact breakage, this results in alteration of contextual information resulting in loss of integrity and scientific information. Stratified sites have considerable potential to reveal information regarding human adaptation to specific environments and ecosystems. For example, the analysis of soils, pollen and faunal materials found in a site can tell us what climatic changes have taken place over time, what types of game were available for subsistence and what plants were used.

Indirect impacts of grazing include the removal of vegetative cover, which facilitates erosion and subsequent damage or complete eradication of cultural sites. In the case of a highly stratified site this could mean the loss of thousands of years' accumulation of cultural material. A proper functioning stream is needed to provide optimal protection for cultural resources located on streambanks and terraces. When adequate vegetation is present to stabilize streambanks and reduce erosion, valuable scientific information regarding human occupation of the area is preserved on the ground.

In addition to impacting historic and pre-historic sites, grazing could adversely affect traditional cultural properties. These areas are associated with cultural practices or beliefs of local communities that have historical significance and continue to maintain the cultural identity of the community. These areas often contain plants or wildlife which are being utilized for subsistence or ceremonial purposes and natural features which may have special meaning to the group. Traditional cultural properties are often hard to recognize since they look like an ordinary mountaintop, lake, or stretch of river. These areas would not come to light through cultural resource surveys. The existence and significance of a traditional use area often can be ascertained only through interviews with knowledgeable users of the area, or through other forms of ethnographic research.

Effects of livestock grazing in the Battle Creek Allotment

The location of known sites was compared to maximum utilization maps for 1992-97 (Table 57). During these years 14 sites were located in areas of severe use. No sites were located in areas of heavy use and 12 sites in areas of moderate use. It is likely that sites located in areas with moderate to severe use are incurring impacts from grazing that could adversely affect the resource.

Based on the 1994-95 stream condition inventory, two sites were located along streams classified as nonfunctioning; two sites were located along streams classified as proper functioning at risk - static; three sites were located along stream segments classified as proper functioning; and two sites were located along unsurveyed stream segments.

Sites located in winter and spring pastures have the potential to be adversely impacted. At these times soils are wet and more vulnerable to impacts from grazing (Table 58).

Table 57. Distribution of cultural resources in relation to grazing use levels determined from Maximum Utilization Map - 1992-97 for the Battle Creek Allotment.

Utilization Level	Native American Sites / Isolates	Historic Sites	Historic Structures	Total
No Use	10	5	1	16
Slight	6	1		7
Light	16			16
Moderate	10	1	1	12
Heavy				0
Severe	12		2	14
Total	54	7	4	65

Table 58. Distribution of cultural resources by season of use and pastures in the Battle Creek Allotment.

Season of Use	Pastures	Native American Sites/Isolates	Historic Sites	Historic Structures	Total
Early Mid-Winter	8	1			1
Early Mid-Spring	21	4			4
Late Spring	12, 22	17		1	18
Late Spring - Summer	10, 15	12		2	14
FFR-Summer	14, 16, 20	11	2		13
No Use	7, 3, 6, 8B	9	5	1	15
Total		54	7	4	65

Seven springs were developed in the allotment. One site was recorded at a spring development. There may be sites located at other spring developments. Many of the springs were developed before 1976 when cultural resource inventories were not performed on a routine basis. One site was located near a water trough; three sites were located at reservoirs; and four sites were located along pipelines.

6. Recreation

a. Special Recreation Management Areas

The 7500-acre C.J. Strike Special Recreation Management Area (SRMA) is the most heavily-used recreational area in the Battle Creek Allotment, with an estimated 22,000 recreational occurrences in 1997. SRMAs are areas BLM has designated for special management attention because of concentrated recreational use and/or the presence of sensitive biological or cultural values. C.J. Strike Reservoir, an impoundment of the Snake and Bruneau Rivers, is an extremely popular recreation destination in southwest Idaho and is rated as one of the 10 most-visited bodies of water in the state (Idaho Statesman, 1995).

Cove Recreation Site on C.J. Strike Reservoir is within the SRMA, with an estimated 15,000 recreational occurrences recorded in 1997. Constructed in 1965, Cove's aging but serviceable facilities include 26 camping sites with ramadas, picnic tables and grills at each site. There are three vault toilets on the site, fishing docks and a boat ramp suitable for small, shallow draft boats. Recreational use remains high from early spring through the fall, peaking on major holidays during that period. Principal recreational activities include picnicking, camping, and fishing. The site is not currently grazed by livestock. Also located in the SRMA is Black Sands Resort, a commercial recreation facility with boat launch facilities, restaurant, bar and RV hookups, operated on public land under a lease arrangement with BLM.

Short, discontinuous remnants of the Oregon National Historic Trail (South Alternate) are found on public lands just south of C.J. Strike Reservoir. The corridor of the Oregon Trail is also managed as an SRMA. An estimated 1100 persons recreated along this corridor in 1997. Principal recreational activities include horseback riding, hiking and historical site viewing.

About 20 miles to the south of C.J. Strike Reservoir, the Jack's Creek escarpment rises to elevations exceeding 6,000 feet. This massive, high plateau is dissected by several deep, scenic canyons including Little Jack's Creek, Halfway Gulch and Shoofly Creek. About 32,500 of the proposed 56,300 acre Jacks Creek SRMA lies in the Battle Creek Allotment. The SRMA, if established, would be managed to provide primitive, non-motorized recreation opportunities, to protect the wilderness values of solitude and naturalness in the Little Jacks Creek WSA, and to provide habitat for California bighorn sheep. Little Jacks Creek is the closest and most easily accessed BLM WSA in Idaho for the cities of Boise, Caldwell, Nampa and Meridian, where a third of the state's population lives. Principal recreational activities include hunting for upland and big game species, wildlife viewing, hiking, backpacking, fishing and camping.

b. Extensive Recreation Management Area

Most of the allotment falls within the larger 1.9 million acre Bruneau Extensive Recreation Management Area (EMA). EMAs are large areas where recreation does not occur at recognized recreation sites, but is spread out over a variety of undeveloped areas. In the low elevation, northern portions of the EMA within the allotment, high summer temperatures limits most recreation use to the spring and fall. The principal recreational activites in this part of the allotment include driving for pleasure on 14 miles of the Owyhee Uplands National Backcountry Byway; hunting, (both upland and big game), and fossil collection from the outcrops of ancient lakebed sediments common to this area.

The Bruneau EMA in the Battle Creek Allotment that lies to the south of the Jacks Creek SRMA is an open, gently rolling plateau, frequently dissected by narrow, rocky canyons. The most popular recreational activities in this area are hunting, siteseeing, camping, driving and motorcycling, and hiking. The EMA is managed to provide dispersed, semi-primitive motorized and non-motorized recreational opportunities, rather than developed, site-based recreation.

Effects of livestock grazing in the Battle Creek Allotment

Cove Recreation Site, the allotment's only developed recreation site, shows little evidence of grazing related-impacts since it is located in a portion of the allotment that has not been grazed since the 1980s. Remnants of the Oregon National Historic Trail are also located in this ungrazed portion of the allotment.

However, numerous undeveloped sites in the allotment lie mostly within unfenced riparian areas where heavy livestock utilization lowers scenic values and the quality of user experience by leaving camping and fishing areas bare of vegetation with accumulations of biological waste that are aesthetically offensive and sometimes unhealthy. In these areas, poor water quality results in lower quality user experience. (e.g. reduced fishing and camping opportunities, concentrations of insects, health concerns.)

Dispersed recreation use is affected by livestock use in some areas of the allotment. Fences that have been erected to control livestock movement interfere with the free movement of hikers, horseback riders, and motorcyclists across the landscape.

7. Wilderness

Approximately 43,600 acres of the 59,070 acre Little Jacks Creek Wilderness Study Area (WSA) lie within the Battle Creek Allotment.

While the WSA remains under consideration by Congress for designation as wilderness, BLM is required to manage the areas in such a way as to not affect the qualities that made them worthy of consideration for preservation as wilderness at the time of inventory in 1981. These four qualities include solitude, naturalness, opportunity for a primitive and unconfined recreation experience, and the presence of special features that enhance wilderness qualities, like California bighorn sheep and redband trout found in parts of the Little Jacks Creek WSA.

Practically, this means that very few, if any, new range improvement projects will be allowed to be constructed in WSAs. Only those new projects whose function is to benefit wilderness values would be considered, and those projects could not impair any of the four wilderness values described above. Examples of projects which might meet the "non-impairment" standard of BLM's Interim Wilderness Management Policy (IMP 1995) are small, hidden water guzzlers for bighorn sheep, or short, temporary gap fences that are well-concealed by topography and vegetation, protect wilderness values (like aquatic habitat for redband trout), and do not promote a "trailing effect" by livestock that leaves a visible scar on the landscape. Large, permanent fence projects or water developments are unlikely to be approved.

Potential effects of livestock grazing

Livestock grazing in WSAs is a grandfathered use; grazing can continue in the same manner and degree as was occurring in 1976. However, grazing can still affect wilderness values. Heavy concentrations of livestock in some riparian and upland areas can adversely affect plant communities and water quality, thereby affecting the recreation experience sought by wilderness users.

Effects of livestock grazing in the Battle Creek Allotment

An estimated 3,401 AUMs of livestock use occur annually in the WSA between May and September (Table 59). Based on the updated 1980 condition survey, ecological condition ratings for the WSA were approximately 11% in poor condition, 50% in fair condition, 34% in good condition, <1% in excellent condition, and 5% burned (Table 59). Trends in ecological condition were generally static to upward depending on the vegetation community and level of livestock use. Low sagebrush communities generally received none to light livestock use and had static to upward trends. Some low sagebrush areas with only Sandberg bluegrass dominated understories were rated in poor or fair condition because the inventory did not recognize the existence of the Very Shallow Stony Loam (10-14") ecological site. Wyoming and mountain big sagebrush communities that received none to light use were generally rated in good condition and had static trends. Wyoming and mountain big sagebrush communities that received moderate to severe use were generally rated in poor or fair condition because of the dominance of increaser grasses in the understory.

Table 59. Season of use, estimated livestock use, and ecological condition from the updated 1980 condition survey of pastures in the Little Jacks Creek Wilderness Study Area, Battle Creek Allotment.

Season	Pasture	% in WSA	Estimated AUMs	Ecological Condition				
				Poor	Fair	Good	Excellent	Burn
Mid Spring	21	15	365	2,127	2,183	365		84
Late Spring	9	100	204		1,388	1,969		
	12	15	63	319	243	49		674
	22	98	1,646	727	15,752	6,819	242	634
Late Spring/ Summer	10	65	1,010	767	1,602	5,152		575
	15	15	113	597	363	237		
Totals			3,401	4,537	21,531	14,591	242	1,967

Livestock use areas were primarily determined by water availability, vegetation community, and topography. Natural water sources including Shoofly, East Fork Shoofly, OX Prong, and Little Jacks (in accessible areas between pastures 10 and 15) creeks historically received heavy to severe use . However, with the exception of Little Jacks Creek, all segments met 4inch stubble height requirements in 1998 and some were making progress toward improving fishery habitat conditions. Stream segments where livestock use was eliminated generally improved in condition between 1983 and 1995. Areas immediately adjacent to developed water and salt sources generally received moderate to severe use. Wyoming and mountain big sagebrush communities received greater use than low sagebrush communities. Rugged canyons and plateaus isolated by rimrock were inaccessible to livestock and received no or limited use. Areas adjacent to the pasture 14 boundary fence received consistent use resulting in depleted understories dominated by Sandberg bluegrass.

Within the WSA, the following documented impacts to naturalness occurred at the time of WSA designation: nine stock-watering reservoirs, three cherry-stem roads totaling 7.5 miles, 10 miles of primitive vehicle ways, and three spring developments. A microwave relay tower and gap fences in Rattlesnake Creek and Halfway Gulch were constructed between 1980 and 1991. Two troughs on the Hutch pipeline were placed in the WSA in 1991. The northern trough, adjacent to Upper East Fork Shoofly Reservoir, is used each year. The southern trough is only used during drought conditions.

Impacts to visual quality were greatest where livestock use was moderate to severe, primarily around water sources and adjacent big sagebrush communities.

VI. EVALUATION

A. Bruneau MFP Objectives

The MFP objectives presented below are those that relate directly to resource conditions in the Battle Creek Allotment that are affected by livestock grazing management. Objectives regarding administrative actions and those not related to livestock grazing are not addressed. An attempt was made to give general conditions under which objectives were met or not met; however, spatial data did not exist to determine specific areas where objectives were met or not met.

1. Range Management (RM)

RM 1: Develop range programs and management techniques to:

a. Increase the vigor, density, and production of desirable vegetation on 421,436 acres within 20 years. These areas are currently in poor condition, but because of low site productivity and the lack of desirable vegetative species, improvement into the fair condition category would not be anticipated. [Explanation: Objective applies primarily to winter and portions of spring pastures where sites are so depleted in decreaser grasses that management is directed at increasing vigor and density of increaser grasses.]

Finding: Plant vigor was influenced primarily by season of livestock use relative to plant phenology, level of livestock utilization, precipitation, and site potential. Plant density was influenced by presence of seed sources and fluctuations in precipitation. Plant productivity was influenced by precipitation levels and plant vigor.

Both annual and perennial grasses were important forage sources for livestock. Grass vigor and productivity were greatest during above normal precipitation years. During drought conditions, perennial grass production declined and annual grass production was minimal.

Early spring/winter use (pasture 8) - This objective was not met where livestock use was moderate to severe. These levels of use generally occurred within one mile of water sources, or approximately up to 42% of the pasture. This objective was met where livestock use was none to light. The lack of spring use during drought conditions (1990-94) reduced the impacts of drought on perennial grasses. Grazing in April occurred during the critical growth period of Sandberg bluegrass, but before the critical growth periods of other perennial grasses. Winter use occurred during the dormant period for all species except Sandberg bluegrass. Plant vigor improved after the drought; however, squirreltail populations remained static at drought levels whereas shrub populations increased.

Mid spring/winter use (pasture 21) - This objective was met where livestock use was none to light. Extensive water developments (approximately 66% of the pasture was within one mile of water sources) resulted in widely distributed livestock and generally slight or light use. This objective was not met where livestock use was moderate to severe. These areas were generally limited to uplands adjacent to water and salt sources. Grazing in May occurred during the critical growth period of squirreltail and Indian ricegrass, but not during the critical growth periods of Sandberg bluegrass and sand dropseed. Winter use occurred during the dormant period for all species except Sandberg bluegrass. Perennial grass and shrub populations were static or increasing in areas with adequate seed sources. Squirreltail populations recovered to or increased beyond pre-drought levels.

b. Increase 333,552 acres currently in poor range condition to fair condition in 20 years. Increase 343,522 acres currently in fair condition to good condition in 20 years. Maintain the condition class of 283,849 acres currently in good and excellent condition. Following this 20 year period, the goal would be to improve all range to good condition. [Explanation: Objective applies primarily to late spring, late spring/summer, and summer pastures]

Finding: Livestock use was the primary factor determining whether or not this objective was met. Additionally, the 1980 condition rating did not recognize the existence of a very shallow stony loam (10-14") ecological site. Sandberg bluegrass was the dominant understory grass in that site. Because of the lack of decreaser grasses, the ecological site would have been incorrectly rated as poor or fair. The extent that the objective was not met due to the lack of recognition of these sites is unknown. Precipitation patterns did not appear to have a substantial effect on conditions at upper elevations.

Livestock use patterns were influenced by community type, topography, and water availability. Mountain big, Wyoming big, and low sagebrush were the primary community types in these areas. Big sagebrush sites generally received the majority of livestock use. Rugged topography (steep slopes, rimrock) and lack of reliable water reduced or precluded livestock access to some areas in late spring and late spring/summer pastures. Available water included perennial streams (usually with limited access to livestock), developed springs, and reservoirs.

Late Spring (pastures 9, 12, 22) - The objective was met in areas receiving none to light use where the trend in ecological condition was static to upward. The 1980 inventory rated 8% of late spring pastures in poor ecological condition, 58% in fair condition, and 31% in good condition. Approximately 32% of the late spring pastures were greater than one mile from water. An additional 17% was within one mile of water, but access was restricted by rimrock or steep topography. Use in these areas and in low sagebrush sites was generally none to light.

This objective was not met in mountain big sagebrush sites that received moderate to severe use where the trend in ecological condition was static at poor or fair. Approximately 51% of the late spring pastures were within one mile of water. Use of mountain big sagebrush sites within one mile of water was generally light to moderate; however, areas within 0.5 miles of the pasture 22/14 boundary fence received heavy use.

Late Spring/Summer (pastures 10, 15, 16) - This objective was met in areas receiving no to light use. The 1980 inventory rated 14% of late spring pastures in poor ecological condition, 46% in fair condition, and 34% in good condition. Approximately 52% of the late spring/summer pastures were greater than one mile from water. An additional 6% was within one mile of water, but access was restricted by steep topography. Use in these areas and in low sagebrush sites was generally none to light.

Approximately 42% of the late spring/summer pastures were within one mile of water. This objective was not met in Wyoming big sagebrush communities within one mile of water that received moderate to severe use. These areas included uplands adjacent to Little Jacks Creek in pastures 10 and 16.

Summer (pastures 14, 20) - The 1980 inventory rated 10% of summer pastures in poor ecological condition, 46% in fair condition, and 42% in good condition. There was a static trend in ecological condition for mountain big and low sagebrush communities. This objectives was met for areas receiving none to light use. This objective was not met in the mountain big sagebrush communities that were sprayed and/or received moderate to severe use.

RM 1.1: Implement intensive management (AMPs) on 14 allotments.

Battle Creek is identified as the first priority allotment for the Bruneau Planning Unit (BPU) in this decision. The priority order was established so that allotments with high resource values or conflicts would have the first AMPs. Special management measures for sage grouse brood rearing areas, critical antelope winter/early spring ranges and the Battle Creek bighorn sheep herd area were primary factors in the prioritization of the allotments.

a. Livestock rest or deferment systems would be established on critical sage grouse brood rearing areas. If grazing systems do not improve habitat conditions, large meadow complexes may be fenced and excluded from grazing or have special grazing management applied.

Finding: Sage grouse brood rearing areas occurred in late spring (12, 22), late spring/summer (10, 15), and summer (14, 20) pastures. This objective was met for wet meadows that had >4inch stubble height at the end of the growing season (40% of wet meadows in late spring pastures, 33% in late spring/summer pastures, and 35% in summer pastures). The objective was not met for wet meadows that had <4inch stubble height at the end of the growing season (60% of wet meadows in late spring pastures, 66% in late spring/summer pastures, and 65% summer pastures). No grazing systems were established in late spring or late spring/summer pastures. A deferred grazing system, with initiation of grazing in late July/early August on alternate years, was implemented in summer pastures. By August, the surface of soils in many wet meadows were generally dry enough to resist compaction or mechanical damage. Wet meadows associated with standing or free flowing water remained wet/saturated and therefore susceptible to damage. Delaying use to late summer helped to meet this objective on 35% of the meadows in summer pastures. Abundance of desirable species was potentially reduced in meadows that received moderate to severe use throughout the use period. Fences were not constructed to protect any wet meadow areas.

b. The improvement of crucial antelope winter/early spring ranges is recognized as a priority management need. Livestock grazing management of these antelope winter/early spring ranges will be designed (system and season-of-use) to improve habitat conditions for wintering antelope.

Finding: Antelope winter/early spring range was primarily located in pasture 21 and to a lesser amount in pasture 22. This objective was met in most of pasture 21 because much of the pasture (66%) received light grazing use. The objective was met in about one-half of pasture 22, where livestock use was none to light - see RM 1.1a and 1.1b for more details.

RM 1.4: Develop livestock management facilities needed for the implementation of AMP's and/ or grazing systems that are designed to reach or maintain objectives and decisions.

Specifically the major constraints include, but are not limited to:

a. Maintain a separation of use between cattle and bighorn sheep by not developing livestock water sources within 1 mile of bighorn habitat or potential habitat unless potential adverse impact to bighorns can be avoided.

Finding: This objective was met for bighorn sheep habitat identified in the MFP. Since that time, additional occupied habitat has been identified. The objective was not met for bighorn sheep habitat identified after the MFP. Extensions of the Hutch pipeline in pasture 22 were placed within a mile of known bighorn sheep habitat in 1991. These troughs are only to be used during drought conditions when traditional water sources are not available.

b. Allow construction of 19 miles of the Jacks Creek Pipeline that lies outside of WSA boundaries. If the Big Jacks Creek WSA is not designated as wilderness, evaluate the pipeline extension up to the bighorn sheep habitat boundary.

Finding: This objective was not met. Multiple conflicts were identified that prohibited satisfactory mitigation with even a partial construction. Even though the MFP allowed for 19 miles of pipeline to be constructed between WSA boundaries, the pipeline would conflict with the visual requirements of range improvements within a half mile of the WSA boundary. There were also concerns regarding a potential decline in ecological condition, and increased interactions between bighorn sheep and livestock once the pipeline was constructed. BLM determined that until a final decision by Congress is made on wilderness designation, the pipeline would not be constructed.

c. No new roads will be constructed into any proposed range improvement site within bighorn sheep habitat or WSA, unless clearly shown not to impact either.

Finding: This objective was met, no new roads were constructed into any range improvement sites within bighorn sheep habitat or WSA.

d. Leave gates at likely ORV race trails and modify on an as needed basis.

Finding: This objective was met.

e. Do not develop springs that will not reasonably provide water for both livestock and wildlife. Springs developed in riparian zones will be fenced and water piped where reasonable and economical.

Finding: This objective was met for previously undeveloped springs. No new springs have been developed in the allotment since the 1960's. This objective was not met for nine previously developed springs. No existing spring developments were protected from livestock use.

f. No water developments within the Oregon Trail corridor depending on topography to minimize visual disturbance, trailing and trampling.

Finding: This objective was met. No water developments were constructed within the Oregon Trail corridor.

g. Livestock management facilities in ACECs will be consistent and compatible with the intent for which the area was designated.

Finding: This objective was met.

RM 1.5: Adjust livestock season of use and/or implement grazing systems on spring and summer ranges to meet minimum growth needs of preferred plant species.

Finding: This objective was met where grazing did not occur during the critical growth period (boot stage, heads showing) of perennial grasses. Grazing in the early spring (pasture 8) occurred during the critical growth period of Sandberg bluegrass and before the critical growth periods of Indian ricegrass, needle-and-threadgrass, and squirreltail. Grazing in mid spring (pasture 21) occurred during the critical growth period of squirreltail and Indian ricegrass, but not during the critical growth periods of Sandberg bluegrass and sand dropseed. A deferred grazing system was never implemented in pastures 8 and 21 which would delay grazing in some years until after seed ripe. Grazing in late spring (pastures 9, 12, 22) occurred during the critical growth periods of bluebunch wheatgrass and Idaho fescue, toward the end of critical growth periods of Thurber's needlegrass and squirreltail (or during if animals drifted into the pastures before May), and after the critical growth period of Sandberg bluegrass. Grazing in late spring/summer pastures (10, 15) occurred during the critical growth periods of bluebunch wheatgrass and Idaho fescue and after the critical growth periods of Sandberg bluegrass and squirreltail. Grazing in summer pastures (14, 16, 20) occurred after the critical growth stage of perennial grasses. A deferred grazing system was implemented in pastures 14 and 20.

RM 2.2: Treat an estimated 85,000 acres of potentially suitable native range to improve ecological condition and increase forage production for livestock and wildlife. Approximately 10,800 acres were identified in the Battle Creek allotment for brush control, and 2,500 acres were identified for brush control and reseeding. The acreages were subject to change as activity plans were developed. Specific stipulations are listed in the MFP (RM 2.2).

Finding: This objective was not met. No acres in the Battle Creek allotment have been treated since 1983.

RM 3: Allocate livestock forage in each of the allotments within the limits necessary to maintain and/or enhance the range and soil resources.

RM 3.1a: Initial livestock use levels by allotment will be established at the five-year licensed active use levels from the years 1976-80 or by mutual agreement. Any subsequent increase or reduction in AUMs through the 5-year implementation schedule will be based on monitoring, and other resource needs as identified in this MFP and any other reasonable requirements as deemed necessary. A 15% decrease in licensed use for Battle Creek Allotment over a 5-year period was identified in the MFP and EIS. A change, however, in BLM policy at the time the MFP was approved required more than a one-point-in-time survey as a basis for reductions in active preference.

Finding: This objective was not met. The Battle Creek and Northwest permittees were issued a decision in 1985 adjusting the preference in the Battle Creek Allotment from 13,386 AUMs to 13,006 AUMs. This 3% reduction was taken in the summer range in Pastures 10 and 15, and shifted to spring range in the Northwest Allotment. The full 15% Grazing EIS reductions were not implemented because of insufficient monitoring data.

RM 3.1b: Provide sufficient food, cover, space, and water for big game in accordance with WL-2.1, 3.1, 3.2, and 3.3 through monitoring. The monitoring will be within key wildlife areas of the habitat.

Finding: Monitoring of vegetation in big game ranges included NPFT, browse transects, and forage utilization transects. We used ecological condition of upland plant communities and browse and grass use levels to determine whether sufficient food was provided. Cover and space requirements varied depending on species. Natural water sources generally provided sufficient water unless physical or behavioral factors reduced wildlife access.

California bighorn sheep - The objective for sufficient food was met where livestock use was none to light and ecological condition was good; bighorn diets were comprised primarily of grasses. The objective was not met in areas that received moderate to severe use (generally Wyoming big sagebrush communities) and ecological condition was poor or fair with a static trend.

The objective for cover was met. Canyons and rimrock, the primary sources of cover, were unaffected by livestock use. Bighorn and livestock were observed to use plateau areas concurrently. It was not clear whether movement of bighorns into canyons was a response to increased temperatures or threshold levels of livestock use.

The objective for sufficient water was met, but stream sources of water that were available to livestock (OX Prong, upper Little Jacks Creek, Shoofly Creek) were in fair to poor condition. Water sources that were largely unavailable to livestock (lower Little Jacks Creek) improved to good condition.

Mule deer - The objective for sufficient food was not met in deer spring use areas (primarily in late spring/summer and summer pastures) that were rated in poor or fair condition or in wet meadows that received moderate to severe use. Grasses and forbs are important foods of deer especially during spring, but are used during other seasons. Sufficient grasses and forbs were provided in areas rated in good ecological condition. Browse (bitterbrush, mountain mahogany) is the primary diet component during the remainder of the year, especially when snow covers grasses. This objective was met when livestock made <50% utilization of bitterbrush in deer summer range and <30% use in deer winter range. Browse utilization by livestock was < 30% in mule deer winter use areas and exceeded 50% only in some summer use areas in 1994. The static trend in the amount of moderate to severely hedged bitterbrush between 1979 and 1996 suggested that heavier livestock use occurred sometime prior to 1993.

The cover objective was met where shrub populations were healthy and maintaining themselves. The objective was not met where fire removed shrub cover or where regeneration was not adequate due to livestock use. Mountain mahogany is an important source of cover for mule deer in the allotment. The objective was also not met where moderate to severe livestock use removed understory vegetation, an important component of fawn cover.

The objective for space was not met where roads were constructed for pipelines and troughs. Increased road densities and associated traffic (especially during hunting season) reduce the space available to mule deer by reducing the effectiveness of available cover. Water developments are used by mule deer; however, they are not necessary. Dispersion of livestock into previously unused areas increased forage use in those areas, thereby negating the benefit additional water provided.

Pronghorn - The objective for sufficient food was met where shrub and grass populations were static or increasing. Shrubs, especially low sagebrush, are the primary food source for pronghorn; however, grasses and forbs are used, even in winter. See RM 1.1b for additional details regarding winter range.

The objective for cover was met where shrubs were maintained. Shrubs and expansive areas (to put distance between pronghorn and predator) are the primary source of cover. The objectives for cover and space were not met where roads were constructed for pipelines and troughs. Increased habitat fragmentation caused by roads reduced the effectiveness of existing cover and space. No additional fences were constructed that impeded pronghorn movement.

The benefits and detriments of water development were similar to those described for mule deer; however, livestock use of previously unused low sagebrush communities was not as great as for big sagebrush communities.

RM 5.1: Manage all lands in a manner which will provide or enhance rare and endangered plants where they exist throughout the planning unit.

Finding: There is insufficient data to determine if this objective was met. The potential to impact these plants in the winter pastures was low because livestock use occurred during the plants' dormant period. The potential to impact sensitive plants in the spring and summer pastures was greater because livestock grazing occurred during the plants' active growing period.

R 1: Manage and protect the Little Jacks Creek RNA. Fence to exclude livestock if necessary to protect RNA values.

Finding: This objective was met. Portions of the RNA within the canyons of Little Jacks and Rattlesnake creeks were inaccessible to livestock. Areas outside the canyon rim received none to slight livestock use because they were greater than one mile from water sources.

2. Wildlife (WL)

WL 1: Protect and improve endangered species habitat within the BPU.

WL 1.2: (Manage bald eagle habitat in the vicinity of C.J. Strike Reservoir to encourage additional use by these birds.)

Finding: Current livestock management does not conflict with bald eagle habitat management.

WL 2: Manage sensitive species habitats in the BPU to maintain existing or potential populations.

Finding: Redband trout - Refer to WL-AQ 2.1, WL-AQ 2.2

Mountain Quail - Refer to WL 2.7.

Bighorn Sheep - Refer to WL 2.1.

Sage Grouse - Refer to WL 4.3, WL 4.4, WL 6.1.

Kit Fox - Refer to WL 2.2.

Spotted Frog - Habitat for this species was found in the Little Jacks Creek, Battle Creek, and Rock Creek drainages. In 1994-95, Little Jacks Creek was rated in poor fisheries habitat condition in the segments where spotted fogs were observed. The trend was static to upward between 1995 and 1998. The segment of Battle Creek on public land was rated in fair fisheries habitat condition. Habitat condition was not rated on Rock Creek. This objective was met on stream segments rated in fair condition where willows and undercut banks provided cover for spotted frogs. This objective was not met where instream and bank cover had been degraded or eliminated (primarily poor condition segments).

Mulford's Milkvetch - Habitat for this species may be present in pastures 8 and 21; however, presence in the allotment is unknown at this time. Long term trend for pasture 8 was static to downward, while the long term trend for pasture 21 was static to slightly upward. The biology of this species is tied to trend, and if present, the objective was not being met in pasture 8.

Mud Flat Milkvetch - Habitat for this species occurs in pastures 9, 12, 14, 20, and 22. Long term trend for pastures 9, 12, and 22 was static to slightly upward. Overall, condition in pastures 14 and 20 was fair to good. Long term trends; however, were static to slightly downward. The response of this species to trend is unknown.

American Wood Sage - This species has been found in pastures 1, 2, 3, 5, 6, 7, and 8A. These are all ungrazed pastures in the northern portion of the allotment. Its pre-livestock distribution is unknown. It is primarily found in ungrazed riparian areas in Idaho. It is possible that this objective was not being met in pastures with riparian zones in poor condition.

WL 2.1: Manage 93,500 acres of bighorn habitat to provide adequate food, cover, water, and space for 420 bighorns by 1990.

a. Bighorn sheep habitat will be monitored to adjust livestock use to provide for 100 bighorns by 1990. The population level is subject to review and change in consultation with IDFG goals.

Finding: This objective was not met. Bighorn sheep numbers have exceeded 100 in the Little Jacks Creek area; however, the IDFG goal of increasing 1991 population levels by 20% was not met.

b. Manage canyonland habitat for the priority of bighorns and other wildlife and allow other reasonable compatible uses. Where necessary to prevent livestock access to these areas, provide management (e.g. salting) or fencing.

Finding: This objective was met where livestock did not have access. Bighorn sheep habitat in the canyonlands of Little Jacks Creek, East and West Forks of Shoofly Creek was in good condition. This objective was met for livestock use areas that were rated in good condition and a static trend in ecological condition. This objective was not met for livestock use areas in bighorn sheep habitat that received moderate to severe use.

c. Maintain a separation of use between cattle and bighorn by not developing livestock water sources within 1 mile of bighorn habitat or potential habitat unless the potential adverse impacts to bighorns can be avoided.

Finding: This objective was not met. Extensions of the Hutch pipeline in pasture 22 were placed within a mile of known bighorn sheep habitat in 1991. These troughs are only to be used during drought conditions when traditional water sources are not available.

WL 2.2: Identify the shadscale desert south of the Snake River as potential kit fox habitat. Coordinate with IDF&G to reestablish this sensitive species based on the merits of such reintroduction at the time contemplated.

Finding: This objective was met. Kit fox habitat has been identified, but no reintroductions are planned for this area.

WL 2.7: Implement intensive livestock management or protective riparian fencing to improve mountain quail habitat in the following areas: Shoofly Creek - both forks.

Finding: This objective was not met between 1983 and 1994. During this time, approximately 4.2 miles of segments in East Fork Shoofly, West Fork Shoofly, and Shoofly creeks deteriorated from fair to poor condition. This objective was met between 1995 and 1998. Intensive livestock management practices were implemented on all stream segments. Approximately 3.3 miles of East Fork Shoofly Creek improved from poor to fair condition. Poor condition segments in West Fork Shoofly and Shoofly creeks were not reinventoried in 1998. Segments in fair condition in Shoofly Creek had an upward trend but remained in fair condition.

WL 3: Manage 1,143,000 acres of big game habitat in the BPU to obtain good ecological condition.

Finding: This objective was met for areas that were rated in good condition (with at least a static trend) and areas in fair condition with an upward trend in ecological condition. This objective was not met for areas that were rated in fair or poor condition and had static trends in ecological condition. See RM 1.1b for details.

WL 3.1: Manage 359,650 acres of mule deer winter and early spring range in the BPU including those areas under Wilderness IMP classification and within IMP management guidelines, so there is adequate food, cover, and water.

a. Implement livestock grazing systems and practices that recognize the physiological requirements of shrubs. Design all systems to improve palatable shrub composition, reproduction, and forage availability. Allow livestock to consume no more than 30% of the current annual production of key shrub species such as bitterbrush.

Finding: This objective was met. There are approximately 45,000 acres of winter range in the Battle Creek Allotment. Use pattern mapping indicated the range was being grazed from slight to light and trend was static to upward. Browse utilization studies indicated that use did not exceed 30%, and 52% of the plants had little or no hedging. Bitterbrush populations were in an upward trend.

WL 3.2: Manage 1,106,000 acres of mule deer spring, summer, and fall range in the BPU including those areas under Wilderness IMP classification and within IMP management guidelines so there is adequate food, cover, and water. Specifically, implement livestock grazing systems and practices that recognize the physiological requirements of forbs and shrubs. Design all systems to improve composition, reproduction, and forage availability of palatable forbs and shrubs in both upland and riparian habitats. Allow no more than 50% total utilization of the current annual production of key shrub species by all classes of animals combined.

Finding: There were approximately 55,000 acres of seasonal range in the Battle Creek Allotment. The objective for shrubs was met during normal or above normal precipitation years. Trend in shrub numbers was upward and utilization was well below the 50% standard during those years. The high percentage of moderate and severely hedged shrubs suggests that this objective was not met during drought conditions. Recruitment and reproduction was occurring in bitterbrush stands, but recruitment was low in mountain mahogany stands. Age class surveys indicated a decrease in the percentage of seedling and young mountain mahogany plants between 1979 and 1996. See RM 3.1.b for discussion on herbaceous forage, cover, and water.

The needs of upland forbs were met in areas with a deferred grazing system (summer pastures). The needs of palatable upland forbs were not met in areas that received use during their critical growing period. The needs of wetland forb species were not met in areas that received moderate to severe use.

a. Maintain water in all developed catchments, pipelines, troughs, and springs to meet big game needs from July 15 until October 31 of each year. Where this is not feasible, consider wildlife guzzlers.

Finding: This objective was met. The systems are normally drained between September 30 and October 20 to prevent damage from freezing. Otherwise, the systems remain active and water is available to wildlife.

WL 3.3: Manage 1,079,000 acres as pronghorn habitat, including those areas under Wilderness IMP classification and within IMP management guidelines to provide sufficient forage, cover, water and space.

a. Manage habitat for good ecological condition where feasible/economical.

Finding: There were approximately 46,000 acres of winter range. Approximately 71% occurred in pasture 21. Lakebed portions of this pasture were managed to increase vigor, density, and productivity of desirable plants. Grass and shrub frequencies were static or increasing in the lakebed area. The remaining winter range (29%) occurred in pastures 9 and 22. This objective was met where trend was static to upward in areas receiving none to light livestock use. This objective was not met in areas where ecological condition was poor or fair, trend was static, and livestock use was moderate to severe. These areas were primarily big sagebrush sites near water sources. See RM 1.a and RM 1.b for more details.

There were approximately 60,000 acres of seasonal range. Approximately 13% occurred in late spring pastures (12, 22), 23% occurred in late spring/summer pastures (10, 15, 16), and 60% occurred in summer pastures (14, 20). This objective was met for low sagebrush communities and areas receiving none to light use. This objective was not met for areas receiving moderate to severe use. See RM 1.b for more details.

b. Maintain water in all developed catchments, pipelines, troughs, and springs to meet antelope needs from July 15 through October 31 of each year.

Finding: This objective was met. The systems are normally drained between September 30 and October 20 to prevent damage from freezing. Otherwise, the systems remain active and water is available to wildlife.

WL 4: Manage upland game and waterfowl habitats in the BPU to increase populations of these highly desired species.

Finding: Upland game species such as sage grouse, mountain quail, and chukar utilize wet meadows and riparian habitats for water, feeding, hiding cover, thermal cover and brood rearing habitat. This objective was not met for upland game in habitats where trend in ecological conditions were static or downward. The objective was met for upland game in habitats in good condition. See RM 1.1a; WL 4.3, 4.4 and 6.1 for details. Both mountain quail and sage grouse are listed as Special Status Species.

Stock ponds were used by migrating waterfowl during spring and fall. Larger impoundments provided nesting cover during the spring. This objective was met for waterfowl in areas that had sufficient nesting cover or available water. Nesting cover was provided around reservoirs in pasture 20 in years when grazing was initiated in late July or August.

WL 4.3: Manage springs, seeps, meadows, and adjacent upland areas as key wildlife habitats for upland game.

a. Control livestock grazing on these habitats by the implementation of grazing systems, season of use and other management practices such as salting away from water sources.

Finding: This objective was not met on springs that received moderate to severe use (67% of springs accessible to livestock) or on wet meadows with <4inch stubble height at the end of the growing season (65% of meadows surveyed). Upland areas immediately adjacent to springs with moderate to severe utilization generally had similar use levels. This correlation of utilization was not as consistent for uplands adjacent to wet meadows. A deferred grazing system in summer pastures allowed some wet meadows to withstand moderate to heavy levels of livestock use (see RM 1.1.a). No other changes were implemented that would deter overuse of these areas. Overuse by livestock in these areas caused vegetative degradation, erosion, increased sediment yields, and habitat destruction. This objective was met on springs that received none to light use (33% of springs accessible to livestock) or on wet meadows with >4inch at the end of the growing season (35% of meadows surveyed). Salting was usually conducted away from springs, seeps, and meadows. Also see RM 1.2.

b. If livestock overuse cannot be avoided, physically protect springheads and wet areas.

Finding: This objective was partially met. Some springheads have been fenced with water being piped to troughs, and gap fences were constructed on Little Jacks and OX Prong to protect riparian habitat. No meadows were fenced and many continue to be overutilized by livestock.

WL 4.4: Manage 520,000 acres of sage grouse range in the BPU including those areas under Wilderness IMP classification and within IMP management guidelines to improve nesting, brood rearing, and winter habitats.

Specifically, to improve the quality of sage grouse nesting and brood rearing habitats, all poor and fair big sagebrush, meadow, and riparian ecological sites should be improved and managed for good ecological condition, based on the SCS ecological site classification system

Finding: This objective was met for 40% of wet meadows in late spring pastures, 33% in late spring/summer pastures, and 35% in summer pastures. See RM 1.1a for more details. Of stream riparian areas, 65% met or were making significant progress towards this objective. See WL 6.1 for more details. Approximately 72% of sage grouse nesting habitat met this objective because it was either in good to excellent condition, or was in fair ecological condition with adequate understory screening (based on light livestock utilization levels). At least 93% of sage grouse winter habitat met this objective as it was rated in fair to good ecological condition. Winter habitats in fair ecological condition met this objective because they had adequate sagebrush stands to provide food and cover for grouse.

WL 6.1: To enhance diversity and abundance, all riparian habitats and meadows will be managed to attain and/or maintain a good ecological condition, based on the SCS ecological site classification system or reasonable equivalent.

Finding: This objective was met on 16.2 miles of stream (55% of total miles surveyed in 1994-95) that were rated in good condition, and on 3 miles rated in fair condition with a recent (1995-98) upward trend. This objective was not met for 3.5 miles and 5.1 miles of stream that were rated in poor and fair condition, respectively. See WL-AQ 2 for details. This objective was met for springs which received none to light livestock use (33% of springs surveyed that were accessible to livestock). This objective was not met for springs which received moderate to severe use (66% of springs surveyed that were accessible to livestock). This objective was generally met for wet meadows that had stubble heights >4inches (35% of those surveyed); however, some of those meadows were not in good ecological condition. This objective was not met for wet meadows that had stubble heights <4inches(65% of those surveyed).

3. Wildlife/Aquatic (WL-AQ)

WL-AQ 2: Improve fisheries physical habitat to fair and good condition by 1989 in 144 stream miles that are in poor or fair condition. Improve water quality in 18 stream sites to chemical constituent levels that are within proper tolerance levels for trout. Special priority should be given to improve habitat of the redband trout, a sensitive species.

Fair to good habitat condition standards for fisheries are as follows:

a. High streambank cover should provide 60 to 80 percent shading to a stream.
b. Low streambank vegetative cover should be mostly over 4 inches in height; sod should be intact with less than 10% bare soil with broken sod.
c. No more than 10 percent of the streambanks in any stream reach should be actively eroding.
d. No more than 5 percent lateral channel movement in any stream reach. There should also be minor channel scouring or changing channels within the streambed (unless a natural condition).
e. No more than 10-15 percent of the stream channel bottom should be covered by fine sediments.
f. Between 25 to 50 percent of the stream channel should contain in-stream fish cover which would include deep pools, undercut banks, boulders, debris, overhanging vegetation, velocity breaks or turbulence.

WL-AQ 2.1: Improve on-site fisheries habitat from poor to fair and good condition on 94.4 public stream miles. The areas specifically listed are designated as high priority fisheries habitat. Upgrading fisheries habitat condition for red band trout and riparian associated wildlife will be the primary management objective on these stream miles. It is anticipated that grazing exclusion is the only practical method to accomplish riparian habitat improvement on these streams. This could be accomplished primarily through gap fencing of livestock access points. If intensive livestock management practices are implemented as the primary method to improve fisheries habitat condition resource response would be carefully monitored. If habitat condition objectives are not being met, livestock would be excluded.

Streams in the Battle Creek Allotment included in this objective are:

Little Jacks Creek (OX Prong)	1.3 miles

Little Jacks Creek (Main)	4.6 miles
Shoofly Creek	2.1 miles
East Fork Shoofly Creek	3.9 miles

Finding: This objective was met for Little Jacks Creek (4.6 miles of stream were rated in good condition or at the upper end of the fair condition rating). It was not met for OX Prong, Shoofly, and East Fork Shoofly creeks, which were evaluated in poor to fair condition in 1994-95, with static to downward trends in condition. During 1995-98, about 3 miles of East Fork Shoofly Creek improved from poor to fair condition, and habitat conditions improved on Shoofly Creek, but the overall condition of Shoofly Creek remained in the fair category.

WL-AQ 2.2: Improve fisheries habitat condition from poor and fair to a good condition through intensive livestock management on riparian areas of 40 stream miles on public lands. Intensive livestock management should be applied with goals directed at insuring that riparian areas receive only light to moderate livestock use to attain good habitat condition standards. Initiate cooperative management programs on those private and state lands adjacent to public lands requiring intensive management.

Intensive livestock management of riparian areas to minimize damage to the fisheries resource should contain combinations of the following practices:

a. Change the present grazing systems in riparian areas to rest rotation, deferred grazing, or exclusion to allow management of these pastures with emphasis on attaining good habitat condition for fisheries.
b. Reduce livestock stocking rates in riparian pastures.
c. Limit the season of use to accommodate vegetative regrowth.
d. Re-distribute cattle away from riparian areas through the use of raised juniper structures placed perpendicular to the stream, and require the placement of salt away from riparian areas through license stipulations.
e. Increase water developments away from streams.

Streams in the Battle Creek Allotment included in this objective are:

Battle Creek	1.0 miles

Finding: This objective was not met for about 0.2 mile of Battle Creek located on BLM managed land. This stream segment was in fair condition in 1998 and is fenced as a water source for livestock using pasture 20.

WL-AQ 3: Protect and manage seasonal flows in perennial and intermittent streams to maintain aquatic/riparian habitat condition on 96 stream miles in good condition. Priority consideration should be given to habitat maintenance for redband trout. [Explanation: This objective applies to Little Jacks Creek, Shoofly Creek.]

Finding: This objective was met for Little Jacks and Shoofly creeks. Stream segments in good condition when the MFP was issued remained in good condition in 1994-95.

WL-AQ 3.1: Work with and provide flow recommendations to Idaho Department of Fish and Game, as information becomes available. Manage flows for good water quality.

Finding: This objective was not met. The BLM measured stream flows in Shoofly and Little Jacks creeks, but has not provided flow recommendations to IDFG. For a discussion of water quality see B. Division of Environmental Quality Water Quality Standards.

4. Watershed (WS)

WS 1: Maintain stability of 408,000 acres of moderate, high, and critical erosion hazard classes by reducing wind or water erosion.

Finding: The objective was met in the majority of the allotment including sandy soils where adequate ground cover, biological soil crusts, perennial grasses, and vegetative litter existed to maintain watershed stability. This objective was not met during drought conditions for upland areas where cheatgrass was the dominant understory species and biological soil crusts did not exist. This objective was not met in sandy washes located within pastures 8 and 21 (a minimum of 1,000 acres). Live vegetation and litter were the primary components of watershed cover in sandy soils. Sandy washes were dominated by cheatgrass, greasewood, and, to a lesser extent, halogeton. Perennial grasses were absent from the majority of sandy washes in both pastures. Substantial erosion occurred during spring runoff and storm events. With the exception of peak spring runoff, the degree of wind and water erosion was moderate in upland portions of pastures 8 and 21.

WS 1.1: Allocate no more than 50 percent of vegetation to consumptive use, minimize erosion by maintaining a perennial vegetation cover where it exists and where feasible/economical strive for establishing perennial vegetative cover to benefit all uses. If not feasible/economical to establish perennial vegetation, manage to achieve stable watershed conditions.

Finding: This objective was met in the majority of uplands where livestock use was none to moderate. This objective was not met during drought conditions for areas in pastures 8 and 21 with cheatgrass dominated understories. Because of voluntary nonuse in pasture 8 between 1990 and 1994, livestock grazing did not contribute to not meeting the objective during those years. The objective was not met in riparian and wet meadow areas that were rated in poor or fair condition or where stubble heights were <4inches.

5. Cultural Resources (CRM)

CRM 1.2: Nominate the sites to the National Register of Historic Places. Incorporate the productive measures necessary for protection from livestock grazing when AMP's are developed. [Explanation: The MFP identified the Oregon Trail, 10-OE-2256 and associated sites as eligible for listing in the National Register of Historic Places. See National Historic Preservation Act of 1966, Section 110 A.2.]

Finding: This objective was not met; however the reason was not related to livestock management. The Oregon Trail and 10-OE-2256 and associated sites have not been nominated.

CRM 2.3: Stabilize cut banks and protect the sites on a case by case basis in coordination with other resource uses to resolve conflicts as they occur.

Finding: No sites have been identified for bank stabilization in the Battle Creek Allotment.

CRM 2.4: Exclude livestock from the sites on a priority case by case basis in coordination with activity plans, wild and scenic river and wilderness management. If reasonable economical alternative water sources are not available the finding will be made at that time on a case by case basis.

Finding: At the time of the MFP site 10-OE-2256 was identified for exclusion of livestock in the Battle Creek Allotment. Subsequent evaluation indicated that fencing would not be beneficial for protecting the site.

6. Visual Resource Management (VRM)

VRM 1: Manage all public land in a manner which will protect and maintain the existing visual qualities, provide for enhancement where consistent with management policies, and provide for rehabilitation of lands that presently do not meet the visual quality standards of surrounding lands.

Finding: This objective was partially met. Spring developments (Snow Creek, Rose Briar) in one of the late-spring pastures were visibly unappealing. Severe livestock use at the two developed springs (Tigert, Little Tigert) in pasture 10 created aesthetic value concerns.

7. Wilderness (WN)

WN-1.4: In the event Congress declares these (Little Jacks Creek WSA) lands "non-suitable for wilderness," they will be managed as follows:

(1) The priority in management will be preservation of bighorn sheep habitat as per W/L-2.1 followed by W/l-3.1 and balanced with RM-1.4 and 2.2. A Herd Management Plan will be written for the bighorn sheep.
(2) Canyonlands will be designated a Special Recreation Management Area to maintain primitive and non-motorized, semi-primitive settings for dispersed recreational opportunities.
(3) ORV use will be limited to designated roads and trails.
(4) The area will be managed as VRM Class II with the roads as Key Observation Points.

Finding: These actions would only be triggered by Congressional action sometime in the future. Nonetheless, they are important to recognize because they could impose some constraints on future management of the allotment.

8. Recreation (R)

R-1.1(4) e: Manage and protect the Jacks Creek Research Natural Area in T. 9S, R. 3E.,Section 5, 6, 7, and 8. Fence to exclude livestock if necessary to protect RNA values.

Finding: This objective was met. This area was established. No fence was built, and there was no evidence of livestock use or impact within the RNA.

B. State of Idaho Water Quality Standards

Water quality criteria for cold water biota are water temperatures at or below 22° C with a daily average temperature of not greater than 19° C (IDAPA 16.01.02.250.02.c). Water quality criteria for secondary contact recreation are fecal coliform bacteria levels not in excess of 800 bacterial colonies/100 ml water at any time, and not in excess of 400 colonies/100 ml water in more than 10% of the total samples taken over a 30 day period (IDAPA 16.01.02.250.01.b).

Finding: State of Idaho water quality criteria for fully supporting beneficial uses were met for Little Jacks, West Fork Shoofly, and OX Prong creeks. State criteria for cold water biota and secondary contact recreation were not met or only partially met for Shoofly and East Fork Shoofly creeks during 1994-97. Criteria for secondary contact recreation were met for these streams in 1998. Current best management practices (BMPs) are to be evaluated and modified when water quality monitoring, based on the criteria listed in Sections 200 (General surface water quality criteria) and 250 (Surface water quality criteria for use classifications), indicate State water quality standards are not met due to nonpoint source impacts (IDAPA 16.01.02.350). To comply with Idaho water quality standards, BLM must evaluate and modify grazing practices on Shoofly and East Fork Shoofly creeks and continue water quality monitoring to evaluate the effectiveness of the revised BMPs.

C. Idaho Standards for Rangeland Health

The following are final determinations for public review. They constitute the official determinations pursuant to 43 CFR 4180.2 at this time.

Standard 1 (Watersheds)

Watersheds provide for the proper infiltration, retention and release of water appropriate to soil type, vegetation, climate and landform.

Indicators may include but are not limited to the following:

(1) The amount and distribution of ground cover, including litter, for identified ecological site(s) or soil-plant associations is appropriate for site stability.

(2) Evidence of accelerated erosion in the form of rills and/or gullies, erosional pedestals, flow patterns, physical soil crusts/surface sealing and compaction layers below the soil surface is minimal for soil type and landform.

Determination: Late spring and summer pastures were meeting the standard. Portions of pastures with early and mid spring grazing were not meeting the standard and livestock grazing was a significant factor. Low elevation pastures in areas where annual grasses were completely removed (from grazing or drought) had indications of accelerated erosion in sandier soils. These soils were most susceptible to erosion because few perennial grasses existed in interspaces, cheatgrass litter was removed by livestock, and the soils do not support biological soil crusts. Low elevation areas with loamier soils met the standards. Gravel and stones were the primary ground cover. These soils support biological soil crusts. Cheatgrass was widespread; however, fluctuations due to drought or livestock use had limited affect on watershed protection.

Standard 2 (Riparian Areas and Wetlands)

Riparian-wetland areas are in properly functioning condition appropriate to soil type, climate, geology, and landform.

Indicators may include but are not limited to the following:

(1) The riparian/wetland vegetation is controlling erosion, stabilizing stream banks, shading water areas to reduce water temperature, stabilizing shorelines, filtering sediment, aiding in floodplain development, dissipating energy, delaying flood water, and increasing recharge of groundwater.

(2) Riparian/wetland vegetation with deep strong binding roots is sufficient to stabilize stream banks and shorelines. Invader and shallow rooted species are a minor component of the floodplain.

(3) Age class and structural diversity of riparian/wetland vegetation is appropriate for the site.

(4) Noxious weeds are not increasing.

Determination: The standard was met for Little Jacks Creek except for upper portions of the stream that were grazed summer long (including OX Prong). It was also met for the upper portions of the East and West Forks of Shoofly Creek. Not met for Shoofly Creek, much of the East Fork Shoofly Creek, and the lowest 0.2 mile of West Fork Shoofly Creek. The standards was not met on 2.2 of 3.0 miles of Dry Creek. Livestock grazing was a significant factor in areas where the standard was not met. Grazing management in 1997 and 1998 on East Fork Shoofly and Shoofly creeks was conducive to improving the streams to proper functioning condition.

Standard 3 (Stream Channel/Floodplain)

Stream channels and floodplains are properly functioning relative to the geomorphology (e.g. gradient, size, shape, roughness, confinement and sinuosity) and climate.

Indicators may include but are not limited to the following:

(1) Stream channels and floodplains dissipate energy of high water flows and transport sediment. Soils support appropriate riparian-wetland species, allowing water movement, sediment filtration, and water storage. Stream channels are not entrenching.

(2) Stream width/depth ratio, gradient, sinuosity, and pool, riffle and run frequency are appropriate for the valley bottom type, geology, hydrology and soils.

(3) Streams have access to their floodplains and sediment deposition is evident.

(4) There is little evidence of excessive soil compaction on the floodplain due to human activities.

(5) Stream banks are within an appropriate range of stability according to site potential.

(6) Noxious weeds are not increasing.

Determination: The standard was met on Little Jacks Creek, OX Prong, and the upper portions of the East and West Forks of Shoofly Creek. It was not met on most of Shoofly Creek, much of East Fork Shoofly Creek, the lowest 0.2 mile of the West Fork Shoofly Creek, the lower 1.6

miles of Dry Creek on the allotment, and grazing was a significant factor. Grazing management in 1997 and 1998 on East Fork Shoofly and Shoofly creeks was conducive to improving the streams to proper functioning condition

Standard 4 (Native Plant Communities)

Healthy, productive and diverse populations of native plants and animal habitats are maintained or promoted as appropriate to soil type, climate and landform.

Indicators may include but are not limited to the following:

(1) Native plant communities (flora and biological soil crusts) are maintained or improved to ensure the proper functioning of ecological processes and continued productivity and diversity of native plant species. Where native communities exist, the conversion to exotic communities after disturbance will be minimized.

(2) The diversity of native species is maintained.

(3) Plant vigor (production, seed and seedstalk production, cover, etc.) is adequate to enable reproduction and recruitment of plants when favorable climatic events occur.

(4) Noxious weeds are not increasing

(5) Adequate litter and standing dead plant material are present for site protection and for decomposition to replenish soil nutrients relative to site potential.

Determination: The standard was not met in the winter/early spring pasture. The standard was met in the late spring and summer pastures. Livestock grazing management practices were significant factors. Perennial plants in the winter/early spring pasture were not vigorous and producing the appropriate amount of seedstalk to maintain recruitment of squirreltail or Sandberg bluegrass, and ecological condition of the communities was static at poor. Due to a periodic lack of adequate litter ground cover, ecological processes of nutrient cycling were below site potential. Native perennial populations and diversity were being maintained or improved in late spring and summer pastures and ecological processes were maintained.

Standard 5 (Seedings)

Rangelands seeded with mixtures including predominately nonnative plants are functioning to maintain life form diversity, animal habitat, production, nutrient cycling, energy flow, and the hydrologic cycle.

Indicators may include but are not limited to the following:

(1) In established seedings, the diversity of perennial species is not diminished over time.

(2) Plant production, seed production, and cover are adequate to enable recruitment when favorable climatic events occur.

(3) Noxious weeds are not increasing.

(4) Adequate litter and standing dead plant material are present for site protection and for decomposition to replenish soil nutrients relative to site potential.

Determination: This standard does not apply because there are no seedings in the Battle Creek Allotment.

Standard 6 (Exotic Plant Communities)

Exotic plant communities (other than seedings) will meet minimum requirements of soil stability and maintenance of existing native and seeded plants. These communities will be rehabilitated to perennial communities when feasible cost effective methods are developed.

Indicators may include but are not limited to the following:

(1) Noxious weeds are not increasing

(2) The number of perennial species is not diminished over time.

(3) Plant vigor (production, seed and seedstalk production, cover, etc.) of remnant native or seeded (introduced) plants is maintained to enable reproduction and recruitment when favorable climatic or other environmental events occur.

(4) Adequate litter and standing dead plant material are present for site protection and for decomposition to replenish soil nutrients relative to site potential.

Determination: We are not meeting, but are making progress toward meeting the standard. Noxious weeds were generally associated with disturbances (pipelines) and areas of livestock concentration (troughs, mineral supplement sites, sandy washes). Noxious weeds were not expanding into adjacent native communities. Establishment of perennial species in noxious weed areas occurred slowly if at all. These areas constitute less than two percent of the allotment.

Standard 7 (Water Quality)

Surface and ground water on public lands comply with the Idaho water quality standards.

Determination: State of Idaho criteria for fully supporting beneficial uses were met for Little Jacks, West Fork Shoofly, and OX Prong creeks. Criteria for temperature were not met or only partially met for Shoofly and East Fork Shoofly creeks and livestock grazing was a significant factor. Criteria for fecal coliform bacteria were met in 1998 on those two streams. Current best management practices (BMPs) are to be evaluated and modified when water quality monitoring, based on the criteria listed in Sections 200 (of the Idaho Administrative Procedures Act; General surface water quality criteria) and 250 (Surface water quality criteria for use classifications), indicate State water quality standards are not met due to nonpoint source impacts (IDAPA 16.01.02.350). To comply with Idaho water quality standards, BLM must evaluate and modify grazing practices on Shoofly and East Fork Shoofly creeks and continue water quality monitoring to evaluate the effectiveness of the revised BMPs.

Standard 8 (Threatened and Endangered Plants and Animals)

Habitats are suitable to maintain viable populations of threatened and endangered, sensitive, and other special status species.

Species specific, any of the indicators for the previous standards may apply.

Determination: The standard was met for redband trout in the Little Jacks Creek drainage with the exception of reduced habitat quality on portions of OX Prong. It was not met for redband trout in East Fork Shoofly and Shoofly creeks, where habitat quality currently is fair, and habitat quality and redband trout numbers declined from 1980 to 1994. Livestock grazing was a significant factor. Trend in aquatic/riparian habitat on Shoofly and East Fork Shoofly creeks is upward since 1995, but is not yet meeting habitat objectives.

The standard was met for mountain quail on the West Fork of Shoofly Creek and the upper segment of East Fork Shoofly Creek, where stream/fisheries habitat was in good condition. It was not met on much of the East Fork of Shoofly Creek, which was rated in fair condition along with portions of Shoofly Creek, and livestock grazing was a significant factor. Recent trend in habitat condition in Shoofly Creek drainage (1995-98) is upward. Currently no mountain quail are known to occupy the Shoofly Creek drainage, but inhabited the drainage in the past.

The standard was met for sage grouse on 85,000 acres (of a total 116,000 acres) of sage grouse habitat on the allotment that was in good ecological condition. It was not met in brood rearing habitat, which was generally in poor to fair condition because of concentrated livestock use on wet meadows and riparian areas.

The standard was met for bighorn sheep. Sheep habitat in Little Jacks Creek and East and West Forks of Shoofly Creek is in good ecological condition. There is no evidence that livestock grazing impacts bighorn sheep habitat.

The standard was not met for spotted frogs, but progress was made towards meeting it. Spotted frogs are known to occupy portions of the Little Jacks, Rock, and Battle creek drainages in the Battle Creek allotment. Only 0.16 mile of Battle Creek is on BLM managed land and trend in condition of stream/fisheries habitat was upward. Habitat conditions of upper Little Jacks Creek were static to upward between 1995-98. The condition of riparian and aquatic habitats of Rock Creek was not assessed.

There is insufficient data to determine if the standard was met for sensitive status plant species on the allotment. Mulford's milkvetch has not been found on the allotment, but may grow in pastures 8 and 21. Trend in ecological condition in pasture 8 was static to downward, which may indicate possible impacts to the milkvetch. Mud Flat milkvetch was found in pastures 9,12,22,14, and 20. Population responses to the static trend in ecological condition of pastures 14 and 20, and the static to slightly upward trend in ecological condition of pastures 9,12, and 22 were unknown. American wood sage grows in ungrazed pastures in the northern portion of the allotment. In Idaho, American wood sage is primarily found in ungrazed riparian areas. Whether it formerly occurred in areas of the Battle Creek allotment that are now grazed by livestock is unknown.

D. Guidelines for Livestock Grazing Management

1. Use Grazing Management Practices (GMPs) and/or facilities to maintain or promote significant progress toward adequate amounts of ground cover (determined on an ecological site basis) to support infiltration, maintain soil moisture storage, and stabilize soils.

2. Locate livestock management facilities away from riparian areas wherever they conflict with achieving or maintaining riparian-wetland function.

3. Use GMPs and/or facilities that maintain or promote soil conditions that support water infiltration, plant vigor, permeability rates, and minimize soil compaction appropriate to site potential.

4. Implement GMPs to provide periodic rest or deferment during critical growth stages to allow sufficient regrowth to achieve and maintain healthy, properly functioning conditions, including good plant vigor and adequate vegetative cover, appropriate to site potential.

5. Implement GMPs that provide sufficient residual vegetation to improve, restore, or maintain healthy riparian-wetland functions and structure for energy dissipation, sediment capture, ground water recharge, streambank stability, and wildlife habitat appropriate to site potential.

6. The development of springs, seeps or other projects affecting water and associated resources shall be designed to protect the ecological functions, wildlife habitat, and significant cultural and historical/archaeological/paleontological values associated with the water source.

7. GMPs maintain, promote, or progress toward appropriate stream channel and streambank morphology functions. Adverse impacts due to livestock grazing will be addressed.

8. GMPs maintain or promote the interaction of the hydrologic cycle, nutrient cycle, and energy flow that will support the types and amounts of soil organisms, plants and animals appropriate to soil type, climate, and landform.

9. Apply GMPs to maintain adequate plant vigor for seed production, seed dispersal, and seedling survival of desired species relative to soil type, climate and landform.

10. Implement GMPs and/or facilities that provide for compliance or are making significant progress toward compliance with Idaho Water Quality Standards.

11. Use GMPs developed in recovery plans, conservation agreements, and Endangered Species Act, Section 7 consultations to maintain or improve habitat for Federally listed threatened, endangered, and sensitive plants and animals.

12. Apply GMPs and/or facilities that maintain or promote the physical and biological conditions necessary to sustain native plant populations and wildlife habitats in native plant communities.

13. Use GMPs to maintain or promote the physical and biological conditions on areas seeded predominately with non-native plants.

14. Native species are emphasized for rehabilitating disturbed rangelands. Evaluate whether native plants are adapted, available, and able to compete with weeds or seeded exotics.

15. Use non-native plant species for rehabilitation only in those situations where:
   a. Native species are not readily available in sufficient quantities;
   b. Native plant species cannot maintain or achieve the standards;
   c. Or, where non-native plant species provide for management and protection of native rangelands.

Include a diversity of appropriate grasses, forbs, and shrubs in rehabilitation efforts.

16. On burned areas, allow natural regeneration when it is determined that populations of native perennial shrubs, grasses, and forbs are sufficient to revegetate the site. Rest burned or rehabilitated areas to allow recovery or establishment of perennial plant species.

17. Carefully consider the effects of new management facilities (e.g., water developments, fences) on healthy and properly functioning rangelands prior to implementation.

18. Use GMPs, where feasible, for wildfire control and to reduce the spread of target undesirable plants (e.g., cheatgrass medusa head wildrye, and noxious weeds) while enhancing vigor and abundance of desirable native or seeded species.

19. Employ GMPs that promote natural forest regeneration and protect reforestation projects until the Idaho Forest Practices Act requirements for timber stand replacement are met.

20. Design management fences to minimize adverse impacts, such as habitat fragmentation, to maintain habitat integrity and connectivity for native plants and animals.

Determination: Many of these Guidelines have been applied in the Battle Creek Allotment in the past and are currently being applied. They will also be used to develop future grazing management proposals which will address existing management problems so that resource conditions improve and the Standards for Rangeland Health are met.

Determination:

I have determined that not all of the applicable Standards and for Rangeland Health are being met and are also not making significant progress and livestock management practices do not conform with all applicable Guidelines for Livestock Grazing Management in the Battle Creek Allotment. Livestock grazing practices are a significant factor in achieving Standards for Rangeland Health and do not conform with the Guidelines for Livestock Grazing Management.

Jamie E. Connell 7/16/99

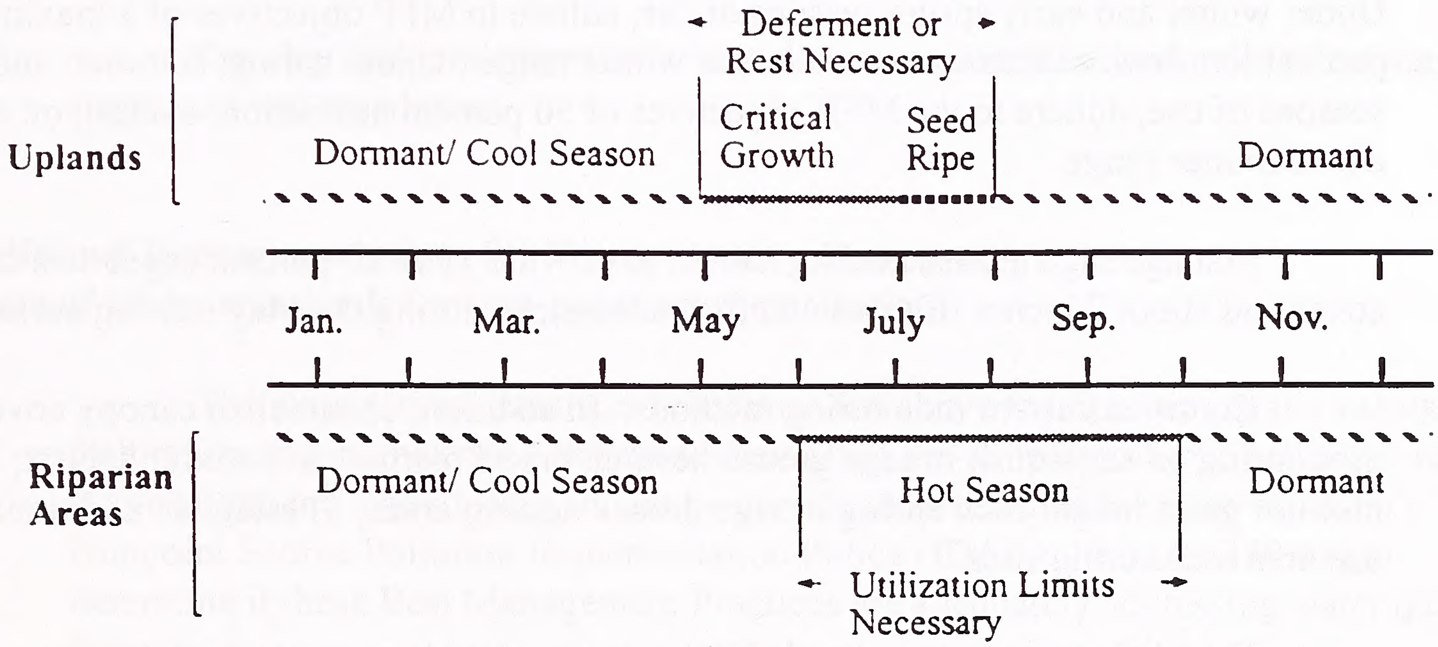
Jamie E. Connell, Area Manager Date

E. Staff Recommendations

General Recommendations to Achieve Management Framework Plan Objectives

- To make significant progress toward achieving land use plan objectives, grazing systems in the Battle Creek Allotment should be designed to provide rest or deferment during the critical growth period for key upland species and substantially lower utilization on riparian vegetation during the hot season. The figure below shows the general time periods during which grazing is most and least appropriate for meeting the biological needs of desirable upland and riparian plant species. The specific time periods will vary in each pasture, depending on elevation, precipitation, and key species present.

Designing Grazing Management to Achieve MFP Objectives



- The amount of grazing that can occur during the critical growth period on uplands or during the hot season on riparian areas depends on the observed ecological condition and trend of the pasture or management unit. Areas that are in good ecological or fisheries habitat condition and in static to upward trend can generally receive light to moderate grazing use during the critical growth period or hot season, if a rest period or deferment system is incorporated. However, areas that are in poor or fair ecological or fisheries habitat condition, or in nonfunctioning condition, and in static to downward trend, generally need to be rested or deferred each year during the critical growth period or receive none to light utilization during the hot season to make significant improvement.

Additional Recommendations for Upland Habitats

- Establish utilization limits lower than 50 percent when an area is grazed during the critical growth period.

- Establish actual use levels and use periods for each pasture.

- Fence important habitat areas (e.g. wet meadow complexes) from larger pastures if the desired season of use for the pasture is not appropriate for the habitat area, or if utilization levels on the habitat area cannot be controlled effectively.

- Pastures containing bitterbrush and mountain mahogany should be grazed in the spring. If not feasible, place pastures in a grazing system that provides as much deferment as possible during the latter part of year, i.e. from mid summer to late fall. Under winter and early spring seasons of use, adhere to MFP objectives of a maximum 30 percent livestock utilization on mule deer winter range. Under spring, summer, and fall seasons of use, adhere to the MFP objectives of 50 percent utilization, overall, on mule deer summer range.

- Manage sage grouse nesting habitat to provide 15 to 25 percent sagebrush canopy cover and about 7 inches of grass and forb understory during the May nesting period.

- Continue current monitoring methods. In addition: 1) establish canopy cover monitoring on sagebrush in sage grouse nesting, brood rearing, and winter habitat; 2) monitor grass height each spring in sage grouse nesting areas; 3) establish additional key use area monitoring sites.

- Establish exclosures in key habitat types to provide comparison areas for monitoring.

Additional Recommendations for Riparian and Aquatic Habitats

- Streams with narrow valley bottoms associated with steep side slopes should be excluded from grazing or fenced into riparian pastures that are grazed prior to July, and the number of AUM's allotted to a riparian pasture should be based entirely on the amount of forage in the valley bottom.

- Highly degraded streams (those with unstable banks that have lost or are losing an active floodplain), especially those in pastures with steep valley side slopes, should be rested until MFP objectives are met.

- Riparian shrubs and sedges and rushes (*Carex* and *Juncus* spp.) should be planted on streams with degraded plant communities (those with bare banks and poor plant species composition) to speed restoration of plant communities needed to hold stream banks together. Streams receiving plantings should be rested until MFP objectives are met.

- Riparian pastures with perennial streams supporting redband trout should have a median stubble height for herbaceous vegetation of 6 inches at all times (i.e. managed primarily to improve/maintain good fisheries habitat condition).

- Permitted AUMs in riparian pastures should be reevaluated after 10 years to determine if the improved riparian habitat conditions in the valley bottoms are providing additional forage that could be utilized while still meeting LUP objectives for riparian/aquatic habitats.

- Develop and implement criteria to determine condition and trend of springs, seeps, and wet meadows.

Additional Recommendations for Water Quality Management (State of Idaho standards for non-point source pollution)

- The management practices recommended above for riparian/aquatic habitat restoration and maintenance should address all of the nonpoint source pollution impacts in the allotment. Monitoring should be continued as outlined the State of Idaho's Nonpoint Source Pollution Implementation Policy (IDAPA 16.01.02.350.01) to determine if these Best Management Practices are adequately addressing water quality impacts.

- If monitoring shows significant progress is not being made towards fully protecting beneficial uses, the management practices should be modified and monitoring continued to evaluate the effectiveness of the new management practices.

Additional Recommendations for Special Status Species

- Exclude livestock (by herding or fencing) from the biological soil crust reference area in pasture 8.

- Do not graze the lakebed portions of pasture 8 from February through September to protect Mulford's Milkvetch and other special status plant species.

- Minimize temporal overlap of livestock use in bighorn sheep habitat areas, especially lamb rearing areas.

- Improve habitat conditions in Shoofly drainage to allow reintroduction of mountain quail.

- Initiate population monitoring on special status plants.

Additional Recommendations for Cultural Resources

- Implement a monitoring program to assess impacts to sites along riparian areas. Stabilize significant sites that are being adversely impacted.

- Implement a monitoring program to assess impacts and propose mitigative measures to protect significant sites in the allotment in addition to the sites that were outlines in the MFP. Target areas should include sites in areas that have been identified as having greater impacts from grazing such as nonfunctioning streams, streams, spring and winter use pastures, and areas with severe to heavy utilization levels.

Additional Recommendations for Recreation Management

- Within the viewshed of Mud Flat Road, blend livestock management with the natural landscape by choosing muted, nonreflective colors and using topography and vegetation to screen developments.

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XII. APPENDICES

Appendix A. A reader's guide to statistical analyses used to interpret data in the AIE.

Statistical analysis relies on sampling a portion of a population to make conclusions about the population as a whole. A population is all members of a given class (ie. all bluebunch wheatgrass plants in late spring pastures, or riparian vegetation along the entire length of Poison Creek). Measuring all individuals in a population is rarely feasible; therefore, a sample of the population is measured (ie. NPFT in late spring pastures, greenline transects along Poison Creek). A sample is meant to be representative of the population.

Once we have sampled a population, we want to answer questions about it. In the AIE, we generally want to know if one population is different from another either in space (ie. Is the density of fish different between Castle and Juniper Creeks?) or time (ie. Did the frequency of bluebunch wheatgrass plants in late spring pastures change between 1983 and 1993?). Statisticians formulate these questions as null hypotheses (ie. H_o: the frequency of wheatgrass plants in late spring pastures did not change from 1983 to 1993). Statistical tests are used to determine if H_o should be accepted (the frequency of wheatgrass plants in late spring pastures did not change from 1983 to 1993) or rejected (the frequency of wheatgrass plants in late spring pastures did change from 1983 to 1993).

Differences between samples can either be real or due to random chance (where we would reject H_o when we shouldn't). In order to feel comfortable that we are correctly accepting or rejecting H_o, we choose a probability (P) value at which we would accept or reject H_o. The P value for the AIE is set at 0.05 (5%). Therefore, we are confident that we are correctly accepting or rejecting H_o 95% of the time. When a statistical test results in a $P \leq 0.05$, then the difference between samples is statistically significant and we would reject H_o.

The type of data collected dictates what statistical tests can be used to determine if H_o should be accepted or rejected. Data collected for the AIE can generally be classified as either measurements of a continuous variable (ie. stubble height, percent shading cover) or presence/absence of a particular entity (ie. occurrence of wheatgrass in a nested plot, age and form class of bitterbrush plants).

The mean (average of all values in a sample) is the most common way to summarize a continuous variable. Each value in the sample varies somewhat from the mean. This variation about the mean is reported as the standard deviation (SD). The greater the standard deviation relative to the mean, the more variation there is in the sample. In general, the mean ± 2 SD will include 95% of the values in a sample.

When the average value in addition to the variation between all observations is of interest, the mean ± 2 SD is reported. For example, when examining the utilization of bluebunch wheatgrass in a pasture, we are interested in both the average use (the mean utilization) and the range of utilization observed in the pasture (shown by the width of the interval given by the mean ± 2 SD), which shows us whether use was uniform across the pasture or whether portions of the pasture were lightly or heavily used relative to the remainder of the pasture.

If the mean is the primary value of interest for the evaluation, then it is presented along with the 95% confidence interval (CI) or the standard error of the mean (SE). Both of these measures provide a range within which we can expect to find the true population mean. Both values are sensitive to sample size, the greater the sample size, the smaller the SE or CI.

The population mean will be within the 95% CI for the sample mean 95% of the time, that is we are 95% sure the true population mean lies within the CI. Means ± CI are reported in the AIE so the reader can compare whether means differ significantly from each other and to provide a relative measure of the amount of variation in the samples from which the mean was calculated. The wider the CI, the more variation there is in the sample used to represent the true population mean.

The mean ± the 95% confidence interval is also used in the AIE when comparing whether the mean value meets or exceeds a MFP objective. For example, the mean utilization of bitterbrush ± 95% CI was used to determine if the average bitterbrush utilization met the MFP standard limiting browse utilization to 50%. If the CI for mean bitterbrush utilization did not include or exceed the MFP standard, then we concluded the MFP objective was met.

When the mean may be compared to data collected in the future or in other areas, then the mean is typically presented along with the SE so that others can compare their data to that in the AIE. By reporting the mean, its SE, and the sample size in the AIE, then others can use them to calculate CIs to compare to the means and CIs from their data.

In order to determine if two or more sample means are significantly different from each other, we look at whether the variation in a sample overlaps that of another sample. This can be done by visually comparing whether 95% CIs overlap or by using statistical tests. The t-test determines whether two samples differ and the analysis of variance (ANOVA) test is used to determine if more than two means are different from each other. Some or all sample means may be different from each other based on an ANOVA test. The Tukey HSD post-hoc test shows which pairs of means are different for a given ANOVA test.

Data that represent classes (presence/absence) must be analyzed based on how the distribution of values in classes differs between samples. With browse data for instance, are the number of young, mature, and decadent plants different between samples taken in 1979 and 1993? The Chi-square test compares different distributions by comparing observed (data collected in the field) and expected (calculated values based on observed values) values. As with means, some observed values may be different from expected values and some may not. The Bonferroni Z test determines which observed values are different from expected values.

Appendix B. Proper use factors (Percent of current years growth allocated to livestock grazing) used with the 1965 and 1980 forage inventories to calculate potential stocking levels.

Forage Species	Proper Use Factors for Different Inventories and Seasons of Use						
	Spring		Summer		Winter		Year-long
	1965	1980	1965	1980	1965	1980	1965
Crested wheatgrass	60	40	40	60	70	60	60
Intermediate wheatgrass	70	30	60	40	70	50	55
Bluebunch wheatgrass	70	30	60	40	70	50	65
Idaho fescue	60	30	60	40	70	50	60
Needle grass	60	30	60	40	-	50	60
Indian ricegrass	70	30	40	40	70	50	65
Sandberg bluegrass	50	50	20	20	40	0	50
Squirreltail grass	40	30	10	40	30	50	30
Needle and thread grass	60	30	50	40	50	50	60
Cheatgrass	20	50	10	20	20	10	20
Kentucky bluegrass	80	30	80	40	-	50	80
Low sagebrush	0	15	0	20	0	30	0
Black sagebrush	10	15	0	20	20	30	10
Bud sagebrush	10	30	0	30	10	10	10
Big sagebrush	0	0-15	0	0-15	10	0-15	0
Shadscale	10	30	0	30	10	10	10
Mountain mahogany	10	20	10	30	-	50	10
Winterfat	30	25	50	30	70	50	50
Bitterbrush	40	15	20	25	50	50	40
Nuttall saltbush	10	15	0	25	30	40	20
Fourwing saltbush	10	20	0	30	75	50	20

Appendix C. Methods used to Adjust Potential Stocking Levels Derived from 1965 and 1980 Forage Production Surveys.

Because the 1965 and 1980 forage production surveys used different proper use factors (Appendix B) and pounds of forage per AUM, the potential stocking levels derived from the two surveys were not directly comparable. To compare the stocking level estimates, the level of forage production of perennial grasses allocated to livestock in both surveys was adjusted to the 50% allocation limit implemented in the MFP for watershed protection. Because the actual yields of each forage species were no longer available for both forage surveys, the estimates of allocatable forage were adjusted upward to the maximum amount from the range of proper use factors for the perennial grasses present in a given plant community and season of use (Table A). For example, if squirreltail grass was one of several increaser grasses in a sagebrush/cheatgrass-increaser community in a spring pasture, then the proper use factor of 40% for squirreltail (Appendix D) was increased to 50% (a 125% adjustment upward) for the 1965 survey. The forage production estimate for the plant community was also increased 125% because that was the largest upward adjustment of a proper use factor for the grasses in that community. If Sandberg bluegrass was the only increaser grass present in the community, then

Table A. Adjustment factors used to convert 1965 and 1980 forage production estimates to an equivalent basis (the MFP 50% forage allocation limit) for comparing potential stocking levels derived from the forage surveys with those from use pattern mapping conducted in 1993-94.

Predominant Shrub Community	% Adjustments Used to Convert Forage Production Estimates to a 50% Use Basis					
	Spring Use		Summer Use		Fall-Winter Use	
	1965	1980	1965	1980	1965	1980
Shadscale/cheatgrass-increaser (ED[1] and D[2])	100-125	100-167	250-500	125-250	125-167	N/A 100
Sagebrush/cheatgrass-increaser (ED and D)	100-125	100-167	250-500	125-250	125-167	N/A 100
Winterfat/cheatgrass-increaser (ED and D)	100-125	100-167	250-500	125-250	125-167	N/A 100
Sagebrush/decreaser (U[3])	71-83	167	83	125	71	100
Mountain mahogany/decreaser (U)	71-83	167	83	125	71	100

[1] ED = extremely depleted plant community (see glossary for definitions).
[2] D = depleted plant community
[3] U = undepleted plant community.

the 50% proper use factor for Sandberg bluegrass for the 1965 survey (Appendix D) would not have been adjusted and the forage production estimate also would have been retained (multiplied by 100% adjustment; Table A). Similarly, when the 1965 proper use factors were >50% (Appendix B), the most conservative downward adjustment in forage production was used.

The stocking levels from the different surveys were also adjusted for differences among surveys in the number of pounds of forage per AUM. Currently, the BLM assigns 1 AUM/800 pounds of forage. Stocking levels from the 1980 forage production survey were based on 1 AUM/708 pounds of forage, and the 1965 forage survey probably used 1AUM/750 pounds of forage. The adjusted stocking levels were directly comparable with each other.

Appendix D. Stream Channel Types and Accessibility to Livestock of Stream Segments on the Battle Creek Allotment.

Stream Segment	Channel Type[a]	Accessibility to Livestock	Length (miles)
BATTL036.8 (Battle Creek)	C6	Accessible to livestock; fenced into the southeast corner of pasture 20 to provide water for livestock. In a very low gradient and narrow (at this point) valley with side slopes of 10-25%.	0.2
LJACK005.3 (Little Jacks Creek)	B[b]	Limited access - sheer canyon walls prevent access to most of segment; livestock can access the top and lower ends of the segment, but the narrow canyon bottom restricts movement.	4.6
LJACK009.8	B3	No access - fence at the lower end of the segment and steep canyon walls with vertical cliffs prevent other access	1.9
LJACK011.7	B3[c]	No access - steep canyon walls with vertical cliffs	1.8
LJACK013.5	B3[c]	No access - steep canyon walls with vertical cliffs	1.8
LJACK015.3	B3	No access - steep canyon walls with vertical cliffs	1.6
LJACK016.9	B3	No access - steep canyon walls with vertical cliffs	4.1
LJACK021.0	B3	Accessible - livestock travel down OX Prong to this segment, or gain access from moderately steep side slopes at the confluence of the 2 streams. Access downstream of this segment is stopped by a boulder-dominated stream channel.	1.2
LJACK022.2	B3	Limited access - livestock can reach the lower end from OX Prong, or by moderately steep side slopes at the confluence of the 2 streams. Cattle can also reach the upper end of this segment by traveling downstream from the upper end of Little Jacks Creek. Livestock do not travel much of the segment because of boulder-dominated reaches that restrict movements. Steep side slopes (>60%) and associated cliff bands stop most access from the plateau on either side of the stream.	1.2
LJACK023.4	B3	Accessible - side slopes (30-40%) allow livestock access to almost entire length. Cattle trails parallel the length of stream on the valley bottom.	1.1
LJACK024.5	C6	Accessible - in low gradient valley with side valley slopes of 5-15%. Mostly private land.	1.7
OXPRO000.0 (OX Prong)	B3	Accessible - moderate side slopes at the top and bottom end of the reach. Cattle travel up and down the stream once reaching the valley bottom.	1.6

Stream Segment	Channel Type[a]	Accessibility to Livestock	Length (miles)
SHOOF017.1 (Shoofly Creek)	B[a]	Accessible - particularly at the upper end (a portion of which is on private land). Livestock traveling downstream in the valley bottom.	0.5
SHOOF017.6	B4	Accessible - in a confined canyon, but livestock reach the stream at areas with moderate side slopes (25%) and by traveling downstream from the more open segment just upstream.	0.4
SHOOF018.0	B6[c]	Accessible - 2-track road parallels the stream for most of the segment. Livestock move up and down the segment via the road and valley bottom.	1.3
SHOOF019.3 (E. Fork Shoofly Creek)	B5[c]	Accessible - livestock reach this lowest portion of East Fork Shoofly Creek by walking up the valley bottom from the next segment downstream. Steep side slopes (40-60%) prevent access from the plateau on either side of the canyon.	1.8
SHOOF021.1 (E. Fork Shoofly Creek)	B4[c]	Accessible - livestock primarily reach this segment by walking up the valley bottom from downstream segments. Steep side slopes (40-60%) prevent access from the plateau on either side of the canyon, except for one side drainage from the west near the upper end of the segment.	1.3
SHOOF022.4 (E. Fork Shoofly Creek)	B4	Inaccessible - except for the lowest 0.75 mile of the segment, which livestock reach by walking up the valley bottom from downstream segments that are more accessible. Steep side slopes (> 60%) prevent other access. Narrow canyon with boulders stops livestock from traveling the entire segment or down from the plateau at the upper end of this segment.	2.4
WFSHO004.8 (W. Fork Shoofly Creek)	B4	Inaccessible - fences upstream and downstream of this segment prevent access via the valley bottom and steep canyon walls (> 60% slopes) prevent other access. Livestock access about 0.25 mi of stream from a side drainage on the west side of the stream (located in T.8S, R.1E, Sec. 23); dense woody shrubs restrict up and downstream movement from this access point.	1.6

[a] B channels are moderately entrenched (confined by side valley slopes) with channel gradients of 2-4%, and have moderate width/depth ratios. C channels are slightly entrenched, occur on gentle gradients (< 2% slopes), have greater sinuosities and width:depth ratios, and are generally located in broad valleys. The numerical code associated with the letter designating the channel type identifies the primary channel materials: 3 = channel is dominated by cobble-sized rocks, 4 = gravel-dominated channel, 5 = sand and small gravel dominated, 6 = silt or clay dominated.

[b] Composition of channel materials was not quantified for this stream reach.

[c] Predominantly B channels; short segments of C channel in less-confined portions of the canyon.

Appendix E. Riparian/Aquatic Habitat Measurements for Stream Segments in the Battle Creek Allotment (measured at permanent monitoring sites ≥ 60 m in length).

Stream Segment	Stream Bank Stability				% Stream Shading	% Pools	Pool Depth (ft)	W:D Ratio[c]	% Fish Cover
	Veg./ Stable	Veg./ Unst.	Unveg/ Stable	Unveg. /Unst.					
LJACK005.3	47.0	0.0	53.0	0.0	18.3	20.0	0.90	18.3	19.3
LJACK009.8	86.0	1.0	13.0	0.0	42.0	38.0[a]	0.50	26.9	28.0
LJACK011.7	-	-	-	-	84.7[b]	46.0	0.56[b]	23.5[b]	-
LJACK013.5	-	-	-	-	83.3[a]	-	-	23.6	-
LJACK015.3	-	-	-	-	81.9	49.0[a]	0.68	24.0[a]	-
LJACK016.9	92.0	2.0	6.0	0.0	64.4	60.0	0.31	46.3	34.0
LJACK021.0	80.0	1.0	18.0	1.0	-	0.0	-	18.6	5.5
LJACK022.2	50.0	8.0	38.0	2.0	36.0	40.0	-	18.9	-
LJACK023.4	56.0	8.0	11.0	25.0	36.9	33.0	-	67.5	-
LJACK024.5	-	-	-	-	-	-	-	-	-
OXPRO000.0	53.0	6.0	15.0	26.0	24.9	0.0	-	40.9	8.5
SHOOF017.1	-	-	-	-	-	-	-	-	-
SHOOF017.6	27.0	22.0	43.0	7.0	-	10.0	0.52	15.5	11.0
SHOOF018.0	59.0	3.0	16.0	22.0	26.9	50.0	0.38	21.3	28.5
SHOOF019.3	15.0	57.0	1.0	27.0	21.8	6.0	-	36.2	0.0
SHOOF021.1	41.0	51.0	1.0	7.0	41.4	30.0	0.13	34.3	3.0
SHOOF022.4	92.0	8.0	0.0	0.0	74.7	10.0	0.22	60.9	3.0
WFSHO004.8	65.0	0.0	35.0	0.0	80.0	-	-	-	-

[a] Mean of measurements from 2 or more sites in that stream segment.
[b] Measured at stream mile 10.4, but representative of Little Jacks 11.7 segment.
[c] Width to Depth ratio of stream channel.

Appendix F. Percent Composition of the Substrate of Stream Segments in the Battle Creek Allotment.

Stream Segment	Fines (<0.1 in.)	Gravel	Med. Gravel	Lg. Gravel	Small Cobble	Large Cobble	Small Boulder	Med. Boul-der	Lg. Boul-der
LJACK005.3	22.0	22.0	31.0	13.0	9.0	3.0	0.0	0.0	0.0
LJACK009.8	2.0	10.0	16.0	19.0	28.0	20.0	5.0	0.0	0.0
LJACK011.7[a]	13.0	6.0	9.0	24.0	24.0	18.0	7.0	0.0	0.0
LJACK013.5	8.0	12.0	9.0	25.0	36.0	8.0	0.0	0.0	0.0
LJACK015.3	10.0	4.0	13.0	21.0	25.0	24.0	3.0	0.0	0.0
LJACK016.9	9.0	17.0	11.0	5.0	27.0	16.0	12.0	3.0	0.0
LJACK021.0	0.0	0.0	10.0	12.0	38.0	40.0	0.0	0.0	0.0
LJACK022.2	7.0	11.0	4.0	4.0	13.0	24.0	21.0	9.0	3.0
LJACK023.4	32.0	6.0	8.0	4.0	24.0	14.0	5.0	3.0	0.0[b]
LJACK024.5	-	-	-	-	-	-	-	-	-
OXPRO000.0	6.0	18.0	8.0	15.0	27.0	25.0	2.0	3.0	0.0
SHOOF017.1	-	-	-	-	-	-	-	-	-
SHOOF017.6	19.0	13.0	17.0	27.0	24.0	0.0	0.0	0.0	0.0
SHOOF018.0	48.0	24.0	14.0	5.0	4.0	4.0	1.0	0.0	0.0
SHOOF019.3	45.0	27.0	14.0	4.0	3.0	6.0	1.0	0.0	0.0
SHOOF021.1	27.0	1.0	2.0	55.0	13.0	2.0	0.0	0.0	0.0
SHOOF022.4	9.0	27.0	29.0	0.0	0.0	0.0	0.0	1.0	0.0
WFSHO004.8	0.0	60.0	34.0	8.0	0.0	0.0	0.0	0.0	0.0

[a] Measured at stream mile 10.4, but representative of Little Jacks 11.7 segment.

[b] Another 4.0% of the substrate was composed of very large boulders.

Appendix G. Special status (BLM sensitive) animal species in the Battle Creek Allotment.

Species	Habitat	Potential conflicts with livestock
Fish, Reptiles, Amphibians		
Interior redband trout[b] *(Oncorhynchus mykiss gairdneri)*	Perennial Streams	Damage to riparian areas; decreased water quality
Western toad[b] *(Bufo boreas)*	Near wetlands	Damage to riparian areas
Spotted frog[a] *(Rana pretiosa)*	Streams, wetlands w/standing water; above 4600 ft. elevation	Damage to riparian areas; range projects
Mojave black-collard lizard[b] *(Crotaphytus bicinctores)*	Rock outcrops in lakebeds	Minimal
Longnose snake[b] *(Rhinocheilus lecontei)*	Shrublands below 5400 ft. Elevation	Conversion of habitat to exotic plants
Western ground snake[b] *(Sonora semiannulata)*	Loose soils (sandy) in sagebrush	Minimal
Northern leopard frog[b] *(Rana pipiens)*	Streams, ponds, and wetlands below 4600 ft.	Damage to riparian areas, range projects
Birds		
Bald eagle[d] *(Haliaeetus leucocephalus)*	Wintering habitat along C.J. Strike Reservoir	Minimal impact
Northern goshawk[b] *(Accipiter gentilis)*	Riparian zones; juniper habitat	Damage to riparian areas
Ferruginous hawk[b] *(Buteo regalis)*	Throughout allotment	Minimal, unless habitat is in poor ecological condition
Peregrine falcon[c] *(Falco peregrines anatum)*	Throughout allotment/ Shoofly drainage	Damage to riparian areas
Mountain quail[b] *(Oreortyx pictus)*	Historically, dense riparian areas	Damage to riparian areas
Long-billed curlew[b] *(Numenius americanus)*	Sparsely vegetated open areas and rolling hills (lakebeds)	Minimal

Species	Habitat	Potential conflicts with livestock
Western burrowing owl[b] *(Speotyto cunicularia hypugea)*	Sagebrush	Minimal, unless habitat is in poor ecological condition
Loggerhead shrike[b] *(Lanius ludovicianus)*	Tall brush and juniper	Minimal, brush conversion
Mammals		
Yuma myotis[b] *(Myotis yumanensis)*	Forage over flat water	Damage to riparian areas
Long-eared myotis[b] *(Myotis evotis)*	Roost in juniper trees; feed heavily in riparian	Damage to riparian areas
Spotted bat[b] *(Euderma maculatum)*	Throughout allotment, feeds near riparian	Damage to riparian areas
Townsend's big-eared bat[b] *(Corynorhinus [Plecotus] townsendii)*	Woody and riparian	Damage to riparian areas
Western pipestrelle[b] *(Pipistrellus hesperus)*	Rock faces; cracks in cliffs; feeds in riparian	Damage to riparian areas
Pygmy rabbit[b] *(Brachylagus idahoensis)*	Tall, dense, Big sagebrush clumps	Unknown; probably minimal with low grazing intensity
Kit fox[b] (Vulpes velox)	Salt desert shrub types	Brush conversion; Habitat degradation
California bighorn sheep[b] (Ovis canadensis califoriana)	Canyons and adjacent uplands; Shoofly Creek	Forage competition; range projects

[a] Federal Candidate Species
[b] State Species of Special Concern/BLM Sensitive Species
[c] Federally listed as Endangered
[d] Federally listed as Threatened

Appendix H. Location (Township, Range, and Section) of sensitive plant species in the Battle Creek Allotment.

Species	Township	Range	Section
American wood sage (*Teucrium canadense* v. *occidentale*)	6S	4E	1
	6S	5E	6, 7
White-margined wax plant (*Glyptopleura marginata*)	7S	2E	13, 14, 32
	7S	3E	3, 4
	7S	4E	29
Packard's buckwheat (*Eriogonum shockleyi* v. *packardae*)	7S	3E	4
Matted cowpie buckwheat (*Eriogonum shockleyi* v. *shockleyi*)	7S	3E	4, 5, 9
Mulford's milkvetch (*Astragalus mulfordiae*)	7S	2E	12, 13
	7S	3E	5, 7
Snake River milkvetch (*Astragalus purshii* v. *ophiogenes*)	7S	3E	5, 9
Janish's penstemon (*Penstemon janishiae*)	7S	4E	19, 10
Mud Flat milkvetch (*Astragalus yoder-williamsii*)	8S	1E	31
	9S	1W	3, 10, 11, 14, 15, 22-24, 27
	9S	1E	6-11, 14, 17-20
Simpson's hedgehog cactus (*Pediocactus simpsonii* v. *robustior*)	8S	2E	2, 28, 36
	8S	3E	31
	9S	2E	1
Trout Creek milkvetch (*Astragalus salmonis*)	8S	2E	3
	9S	1E	1

Appendix I. Habitat requirements and potential conflicts with livestock of sensitive plant species in the Battle Creek Allotment.

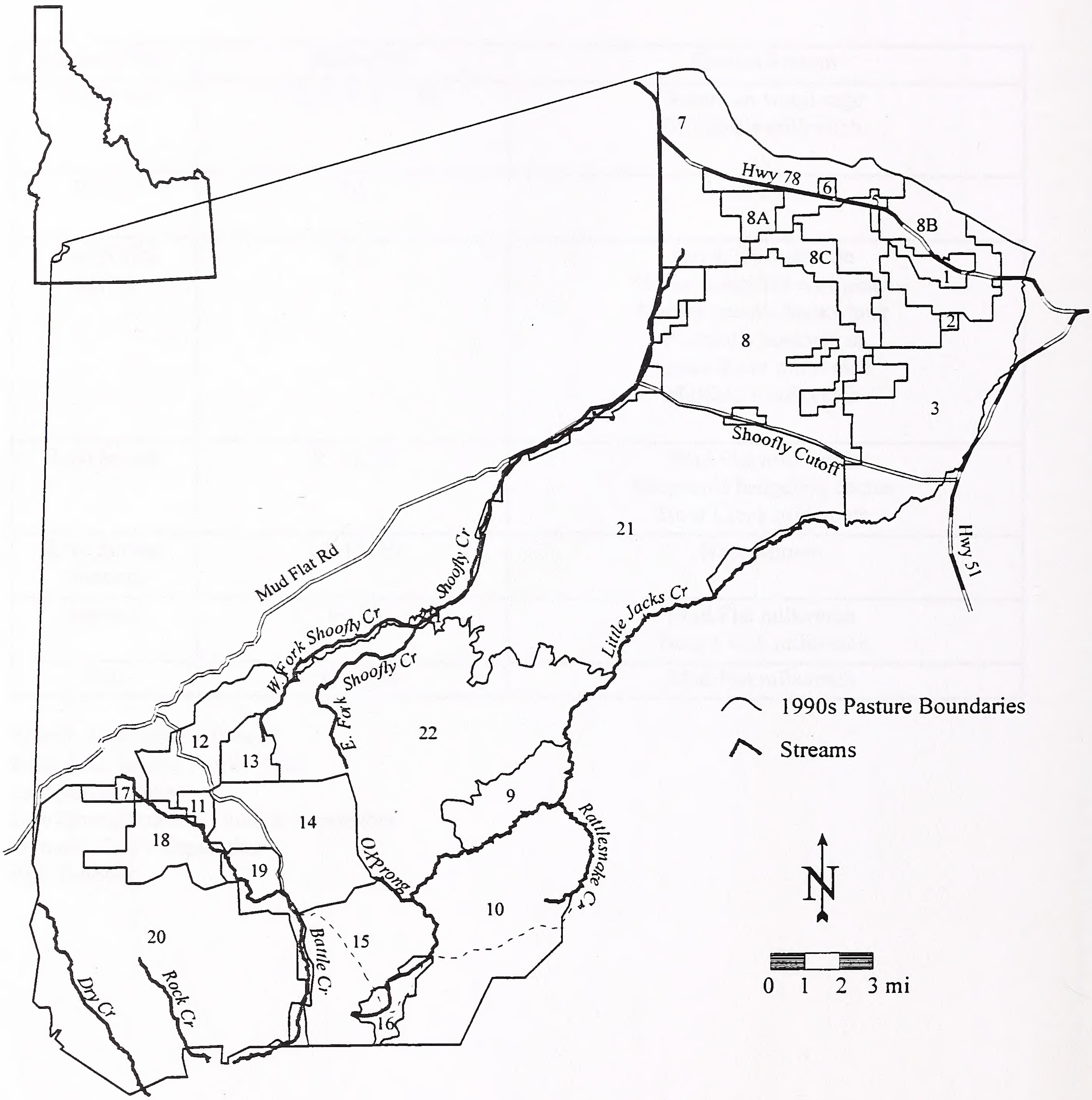
Species	Habitat	Potential Conflicts with Livestock
American wood sage (*Teucrium canadense* v. *occidentale*)	Rocky sites on the edge of riparian areas	Excessive use of riparian areas; trampling and possibly grazing
White-margined wax plant (*Glyptopleura marginata*)	Sandy soils in salt desert shrub and Wyoming big sagebrush habitat	Range projects
Packard's buckwheat (*Eriogonum shockleyi* v. *packardae*)	Lakebed sediments and oolitic limestone outcrops in salt desert shrub habitat	Range projects, water developments
Matted cowpie buckwheat (*Eriogonum shockleyi* v. *shockleyi*)	Lakebed sediments with a cobbly desert pavement surface and gravelly calcium carbonate deposits over basalt	Range projects, water developments
Mulford's milkvetch (*Astragalus mulfordiae*)	Deep sandy soils, usually with needle-and-thread grass	Grazing, habitat degradation
Snake River milkvetch (*Astragalus purshii* v. *ophiogenes*)	Sandy and occasionally silty soils in salt desert shrub habitat	Range projects
Janish's penstemon (*Penstemon janishiae*)	Lakebed soils in salt desert shrub and Wyoming sagebrush habitat	Grazing, range projects
Mud Flat milkvetch (*Astragalus yoder-williamsii*)	Cindery and loamy soils in lower elevation mountain big sagebrush-Idaho fescue habitat	Range projects, trampling
Simpson's hedgehog cactus (*Pediocactus simpsonii* v. *robustior*)	On benches and canyon rims in rocky or sandy soil in low sagebrush habitat	None known
Trout Creek milkvetch (*Astragalus salmonis*)	Stony flats and hillsides among low sagebrush, in deep soils overlying basalt or rhyolite	None known

Appendix J. Known locations of sensitive status plant species in Battle Creek Allotment pastures.

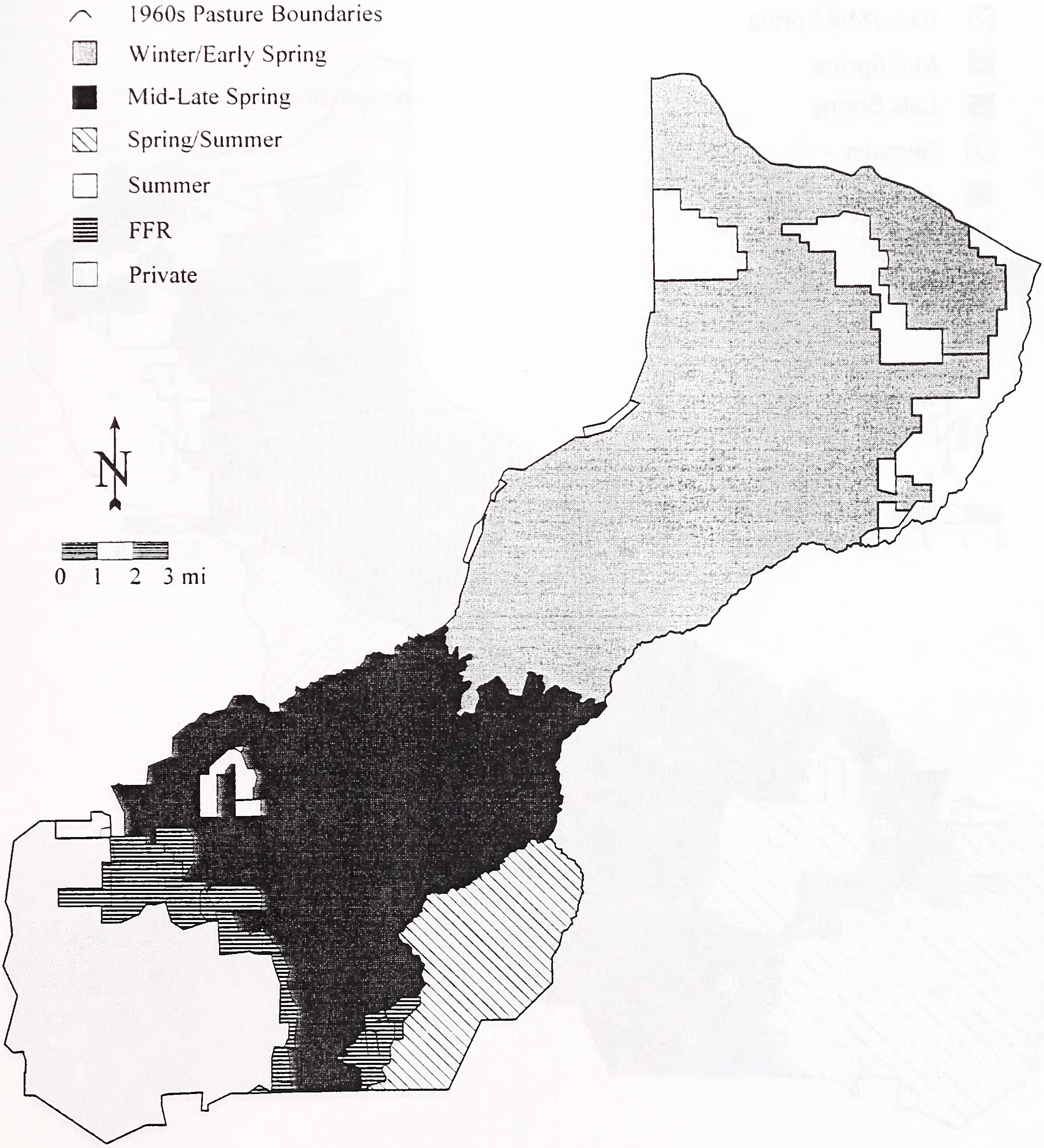
Season of Use[1]	Pasture(s)	Species Present
Ungrazed	1, 2, 3, 5, 6, 7, 8B	American wood sage Mulford's milkvetch
Winter	8A	None known
Early-Mid Spring	8, 21	Janish's penstemon White-margined wax plant Matted cowpie buckwheat Packard's buckwheat Snake River milkvetch Mulford's milkvetch
Late Spring	9, 12, 22	Mud Flat milkvetch Simpson's hedgehog cactus Trout Creek milkvetch
Late Spring/ Summer	10, 15, 16	None known
Summer	14, 20	Mud Flat milkvetch Trout Creek milkvetch
Fall	11, 18, 19	Mud Flat milkvetch

Winter: November - January
Early-Mid Spring: April - May
Late Spring: June
Late Spring/Summer: June to September
Summer: July - September
Fall: October

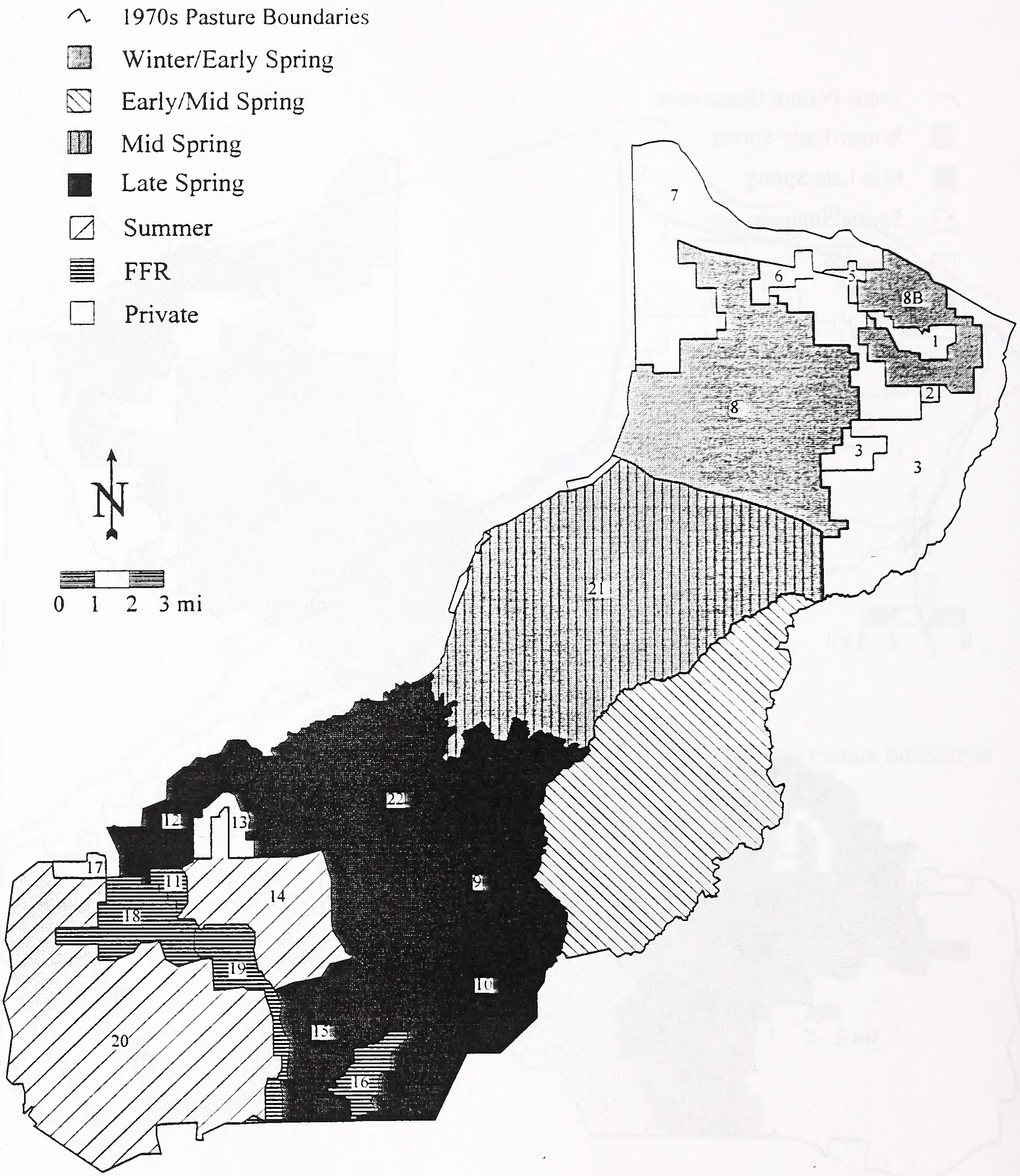
XIII. MAPS



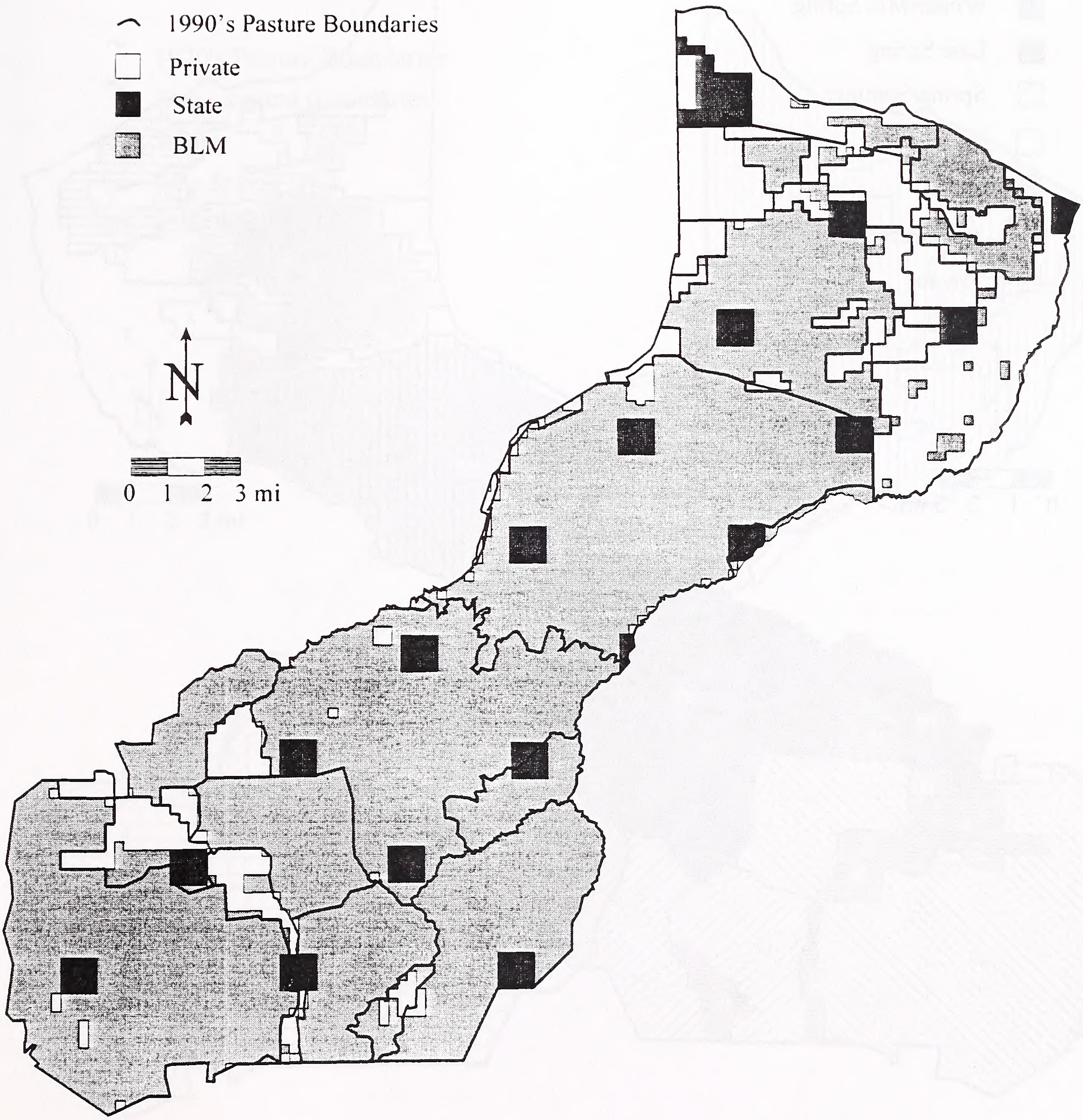
Map 1. Location of the Battle Creek Allotment and 1990 pasture boundaries, roads, and streams.



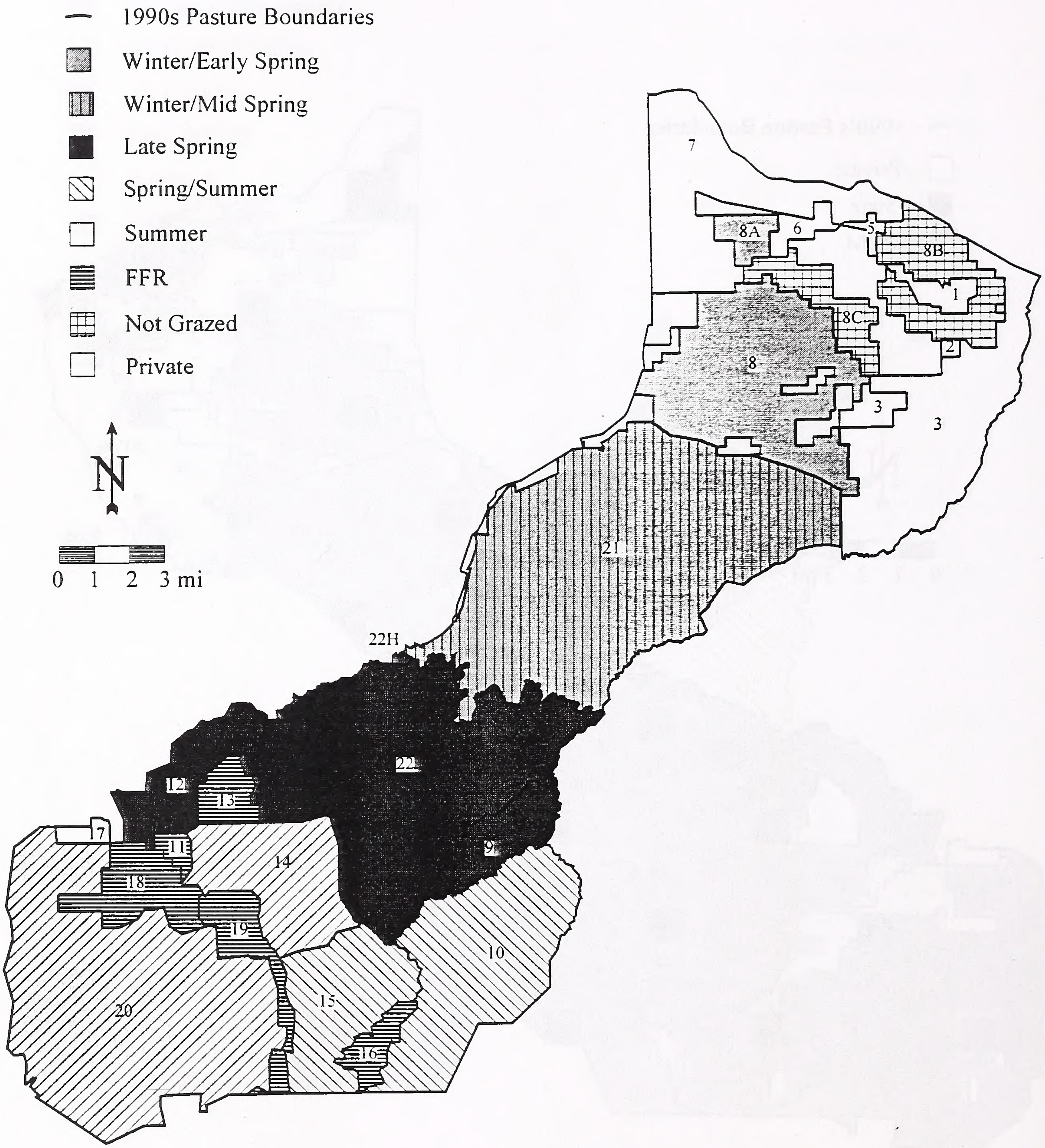
Map 2. Pasture boundaries and seasons of livestock use prior to the 1969 Battle Creek Allotment Management Plan.



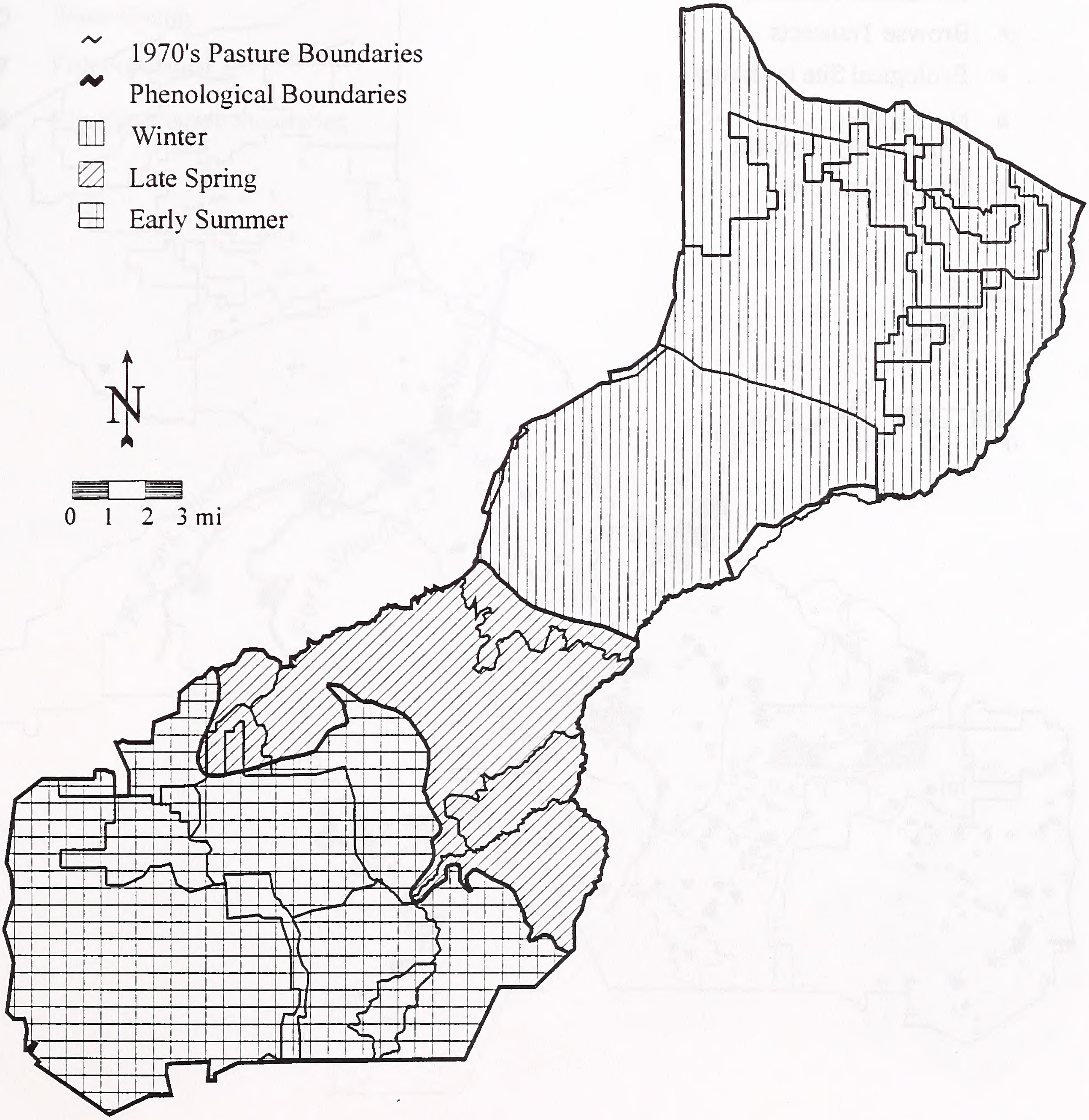
Map 3. Pasture boundaries and seasons of livestock use during the 1970s in the Battle Creek Allotment.



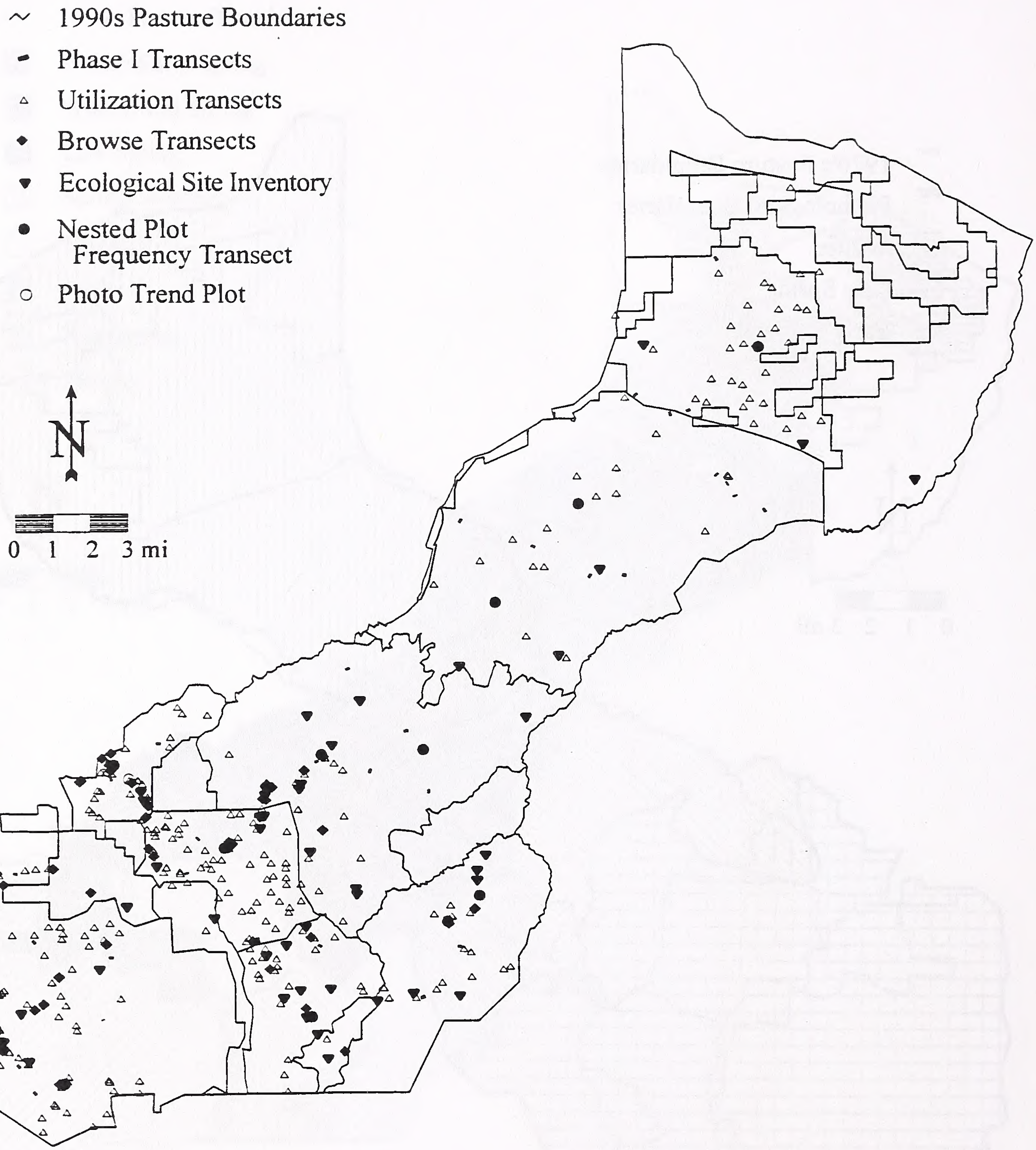
Map 4. Private, State, and BLM ownership in the Battle Creek Allotment, 1997.



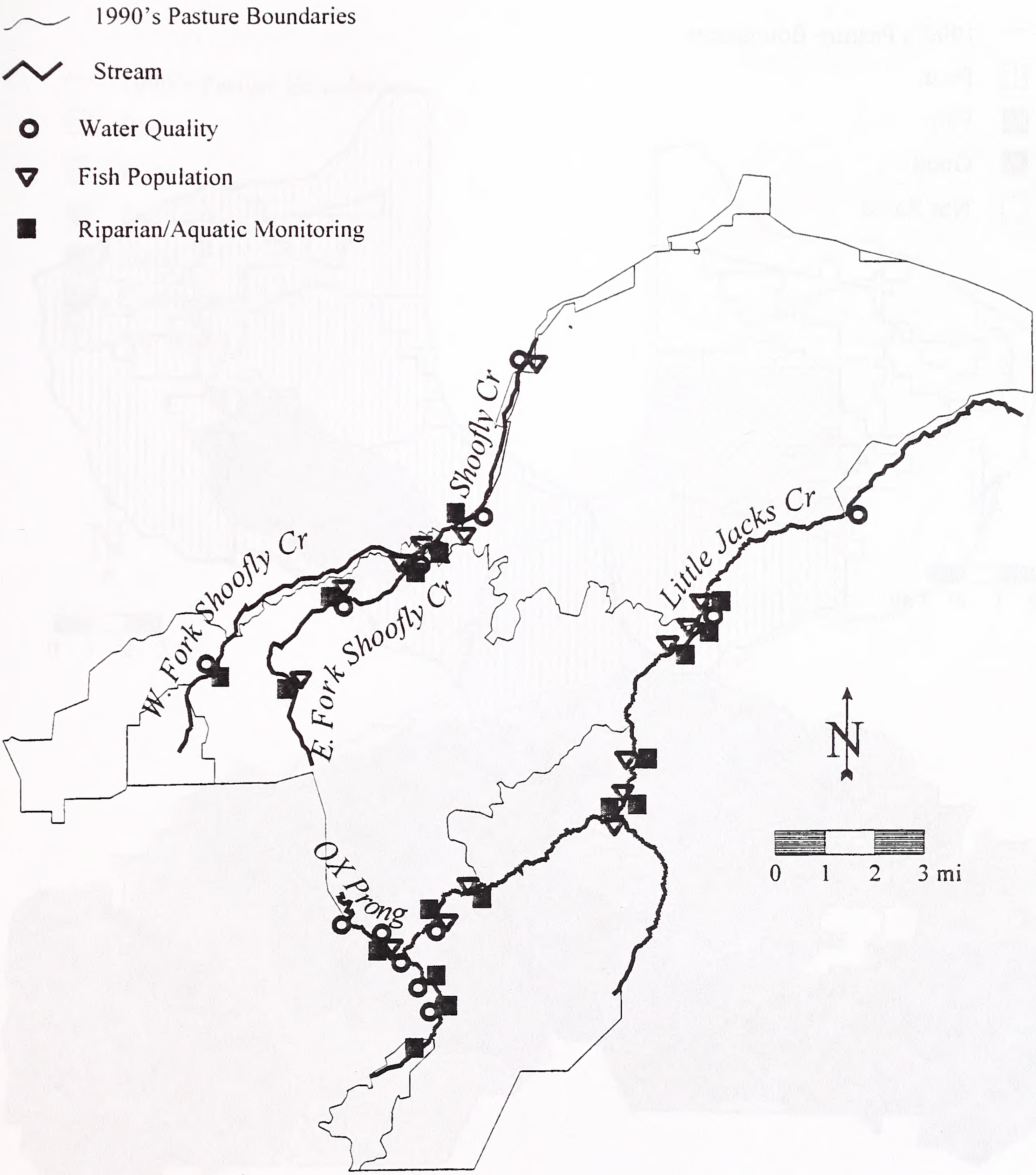
Map 5. Pasture boundaries and seasons of livestock use during the 1990s in the Battle Creek Allotment.



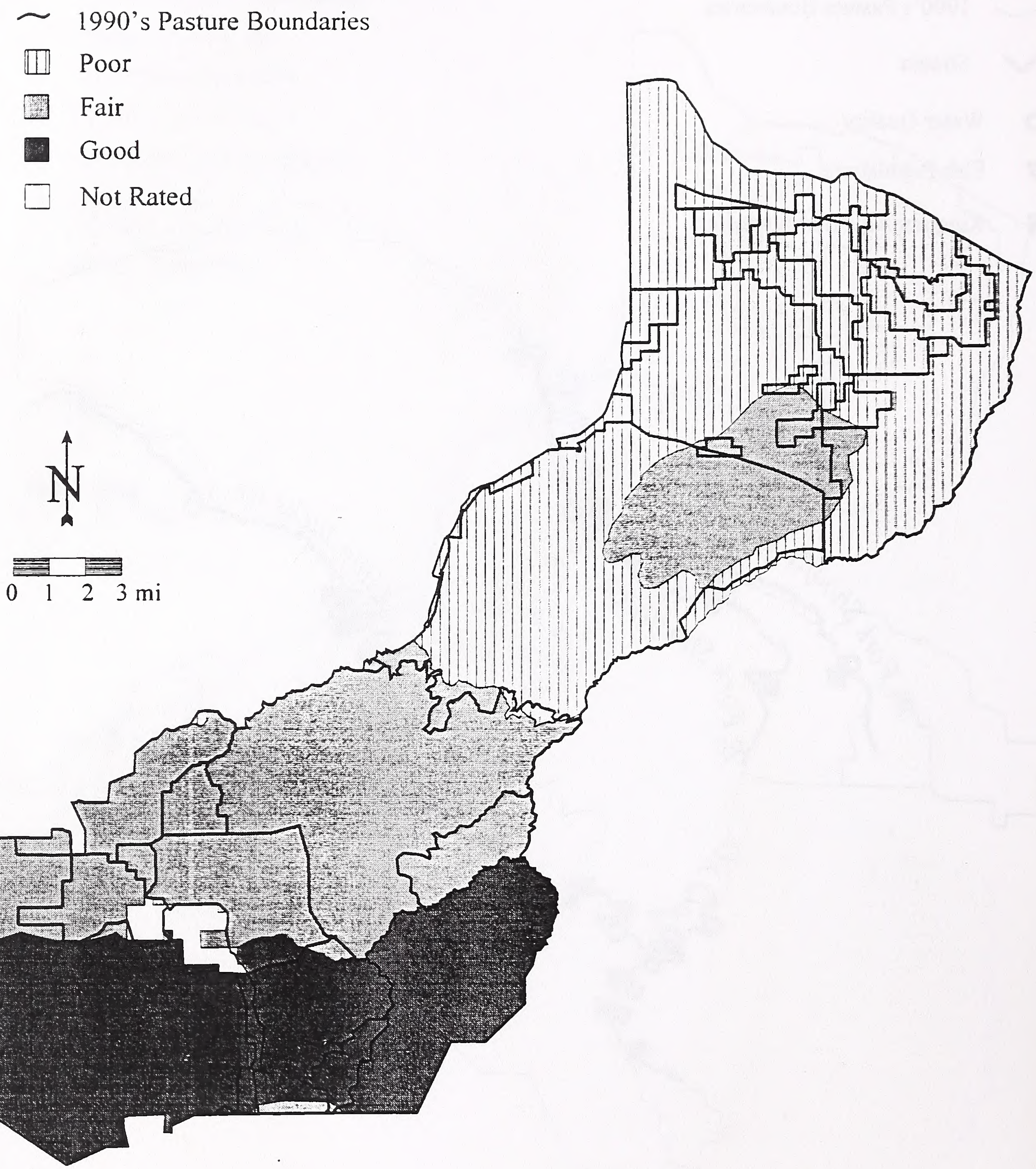
Map 6. Season of use for the Battle Creek Allotment based on phenology zones from the 1968 Boise District Phenology Study.



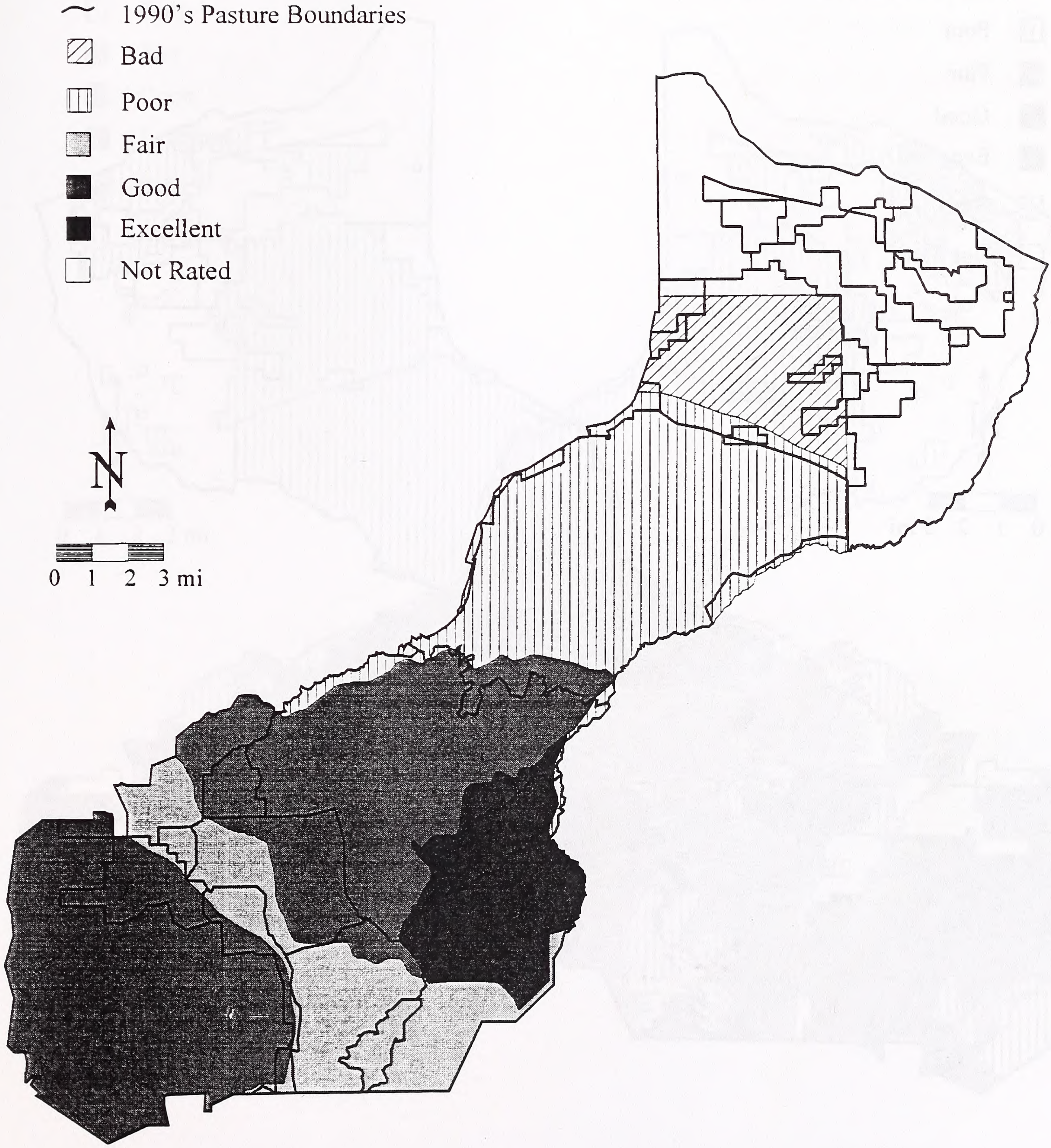
Map 7. Location of upland habitat sampling transects and points in the Battle Creek Allotment, 1974-98.



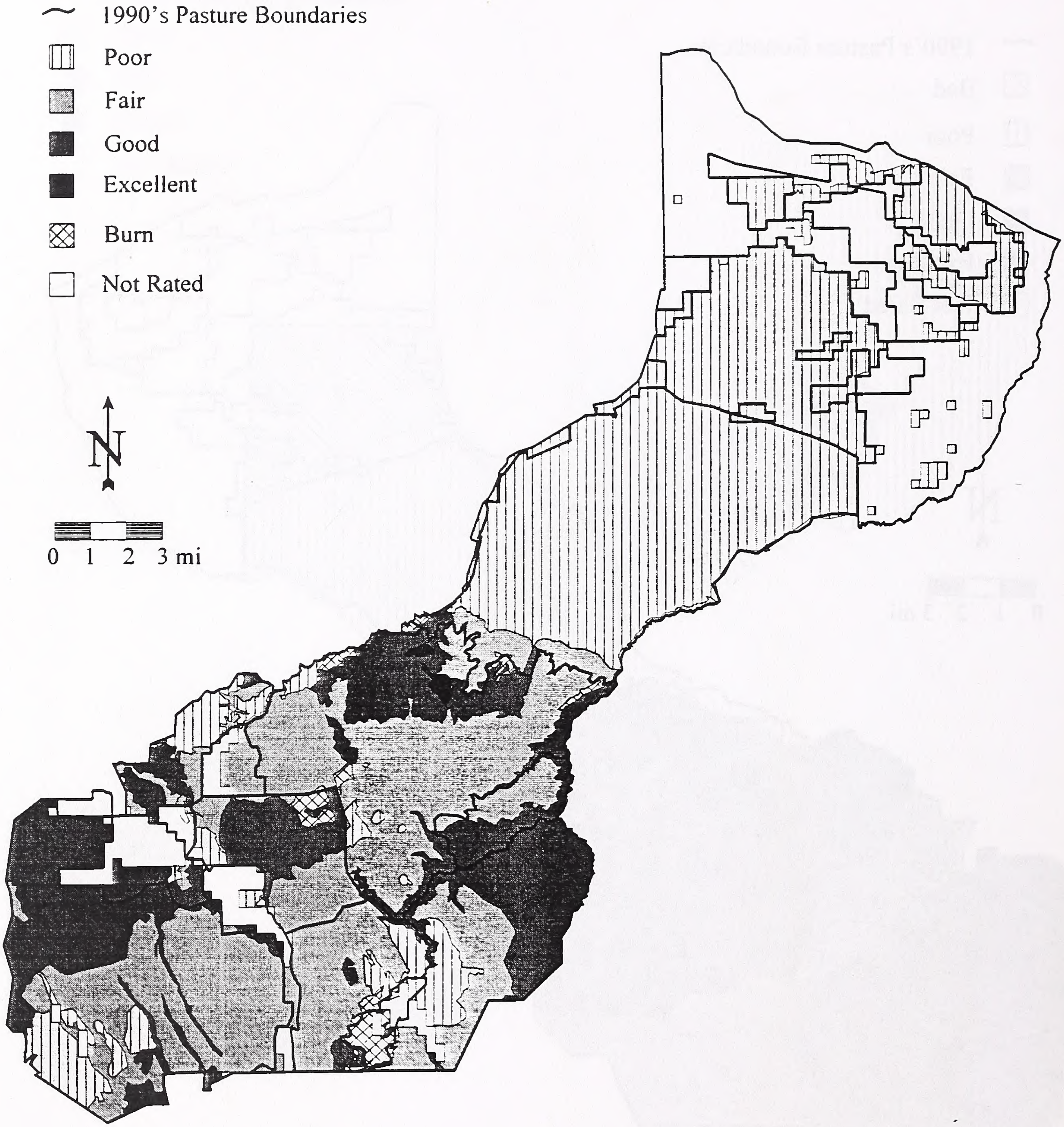
Map 8. Location of riparian/aquatic habitat sample sites in the Battle Creek Allotment.



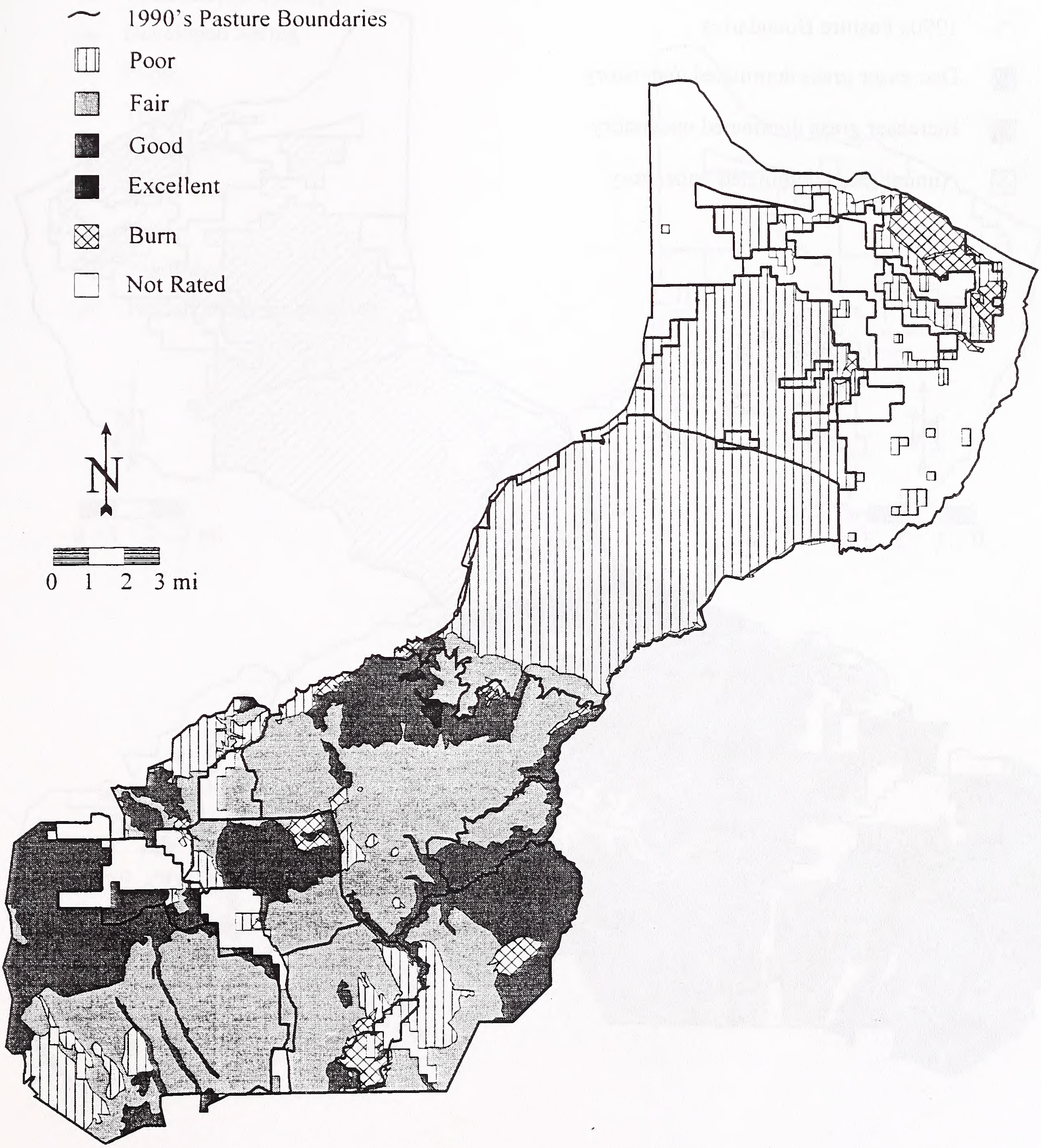
Map 9. Range condition based on the 1959 Deming Two-Phase Survey, Battle Creek Allotment.



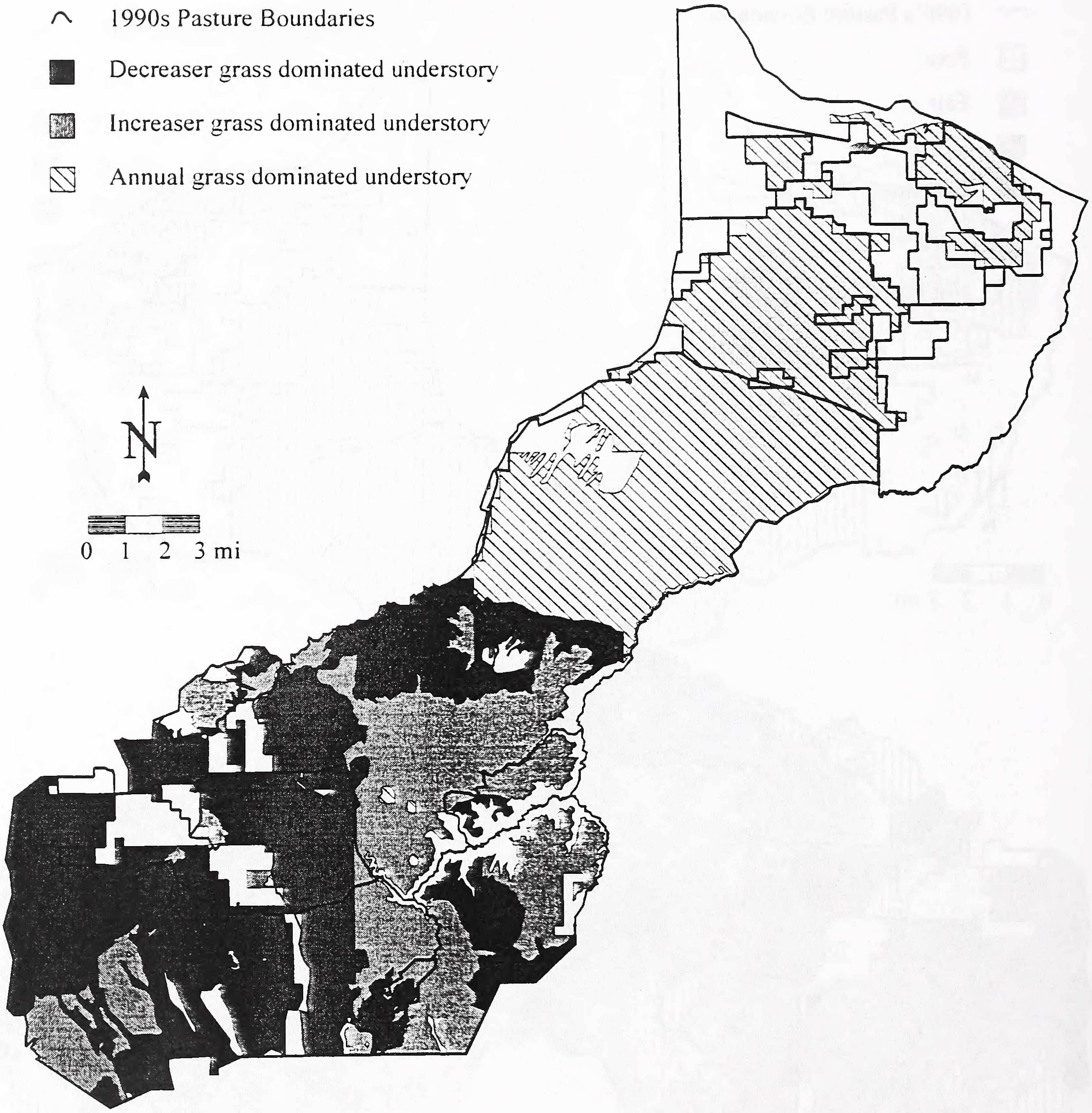
Map 10. Range condition based on the 1966 Unit Resource Analysis, Battle Creek Allotment.



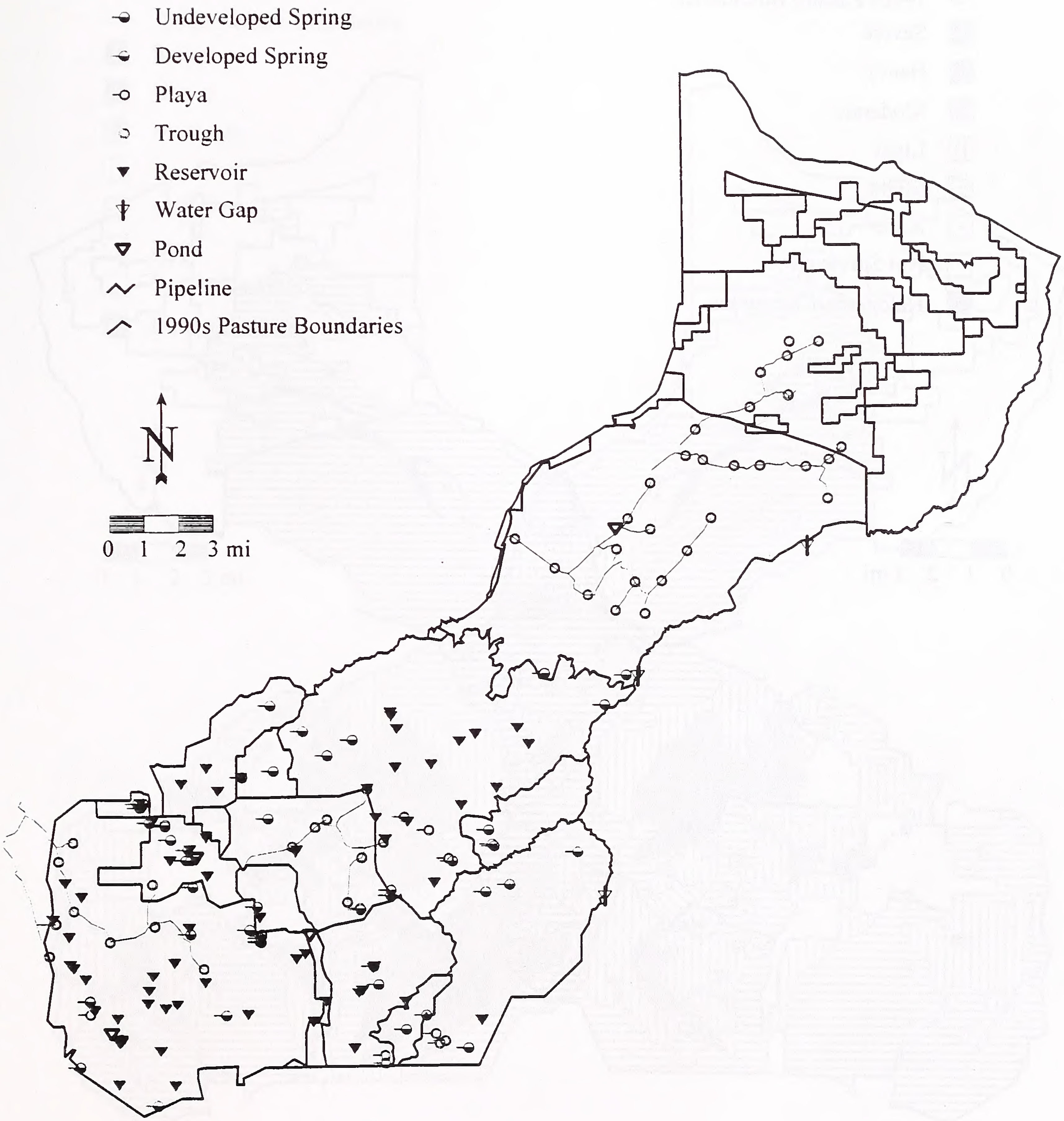
Map 11. Ecological condition based on the 1980 forage production sampling of the 1979 ecological condition class mapping, Battle Creek Allotment.



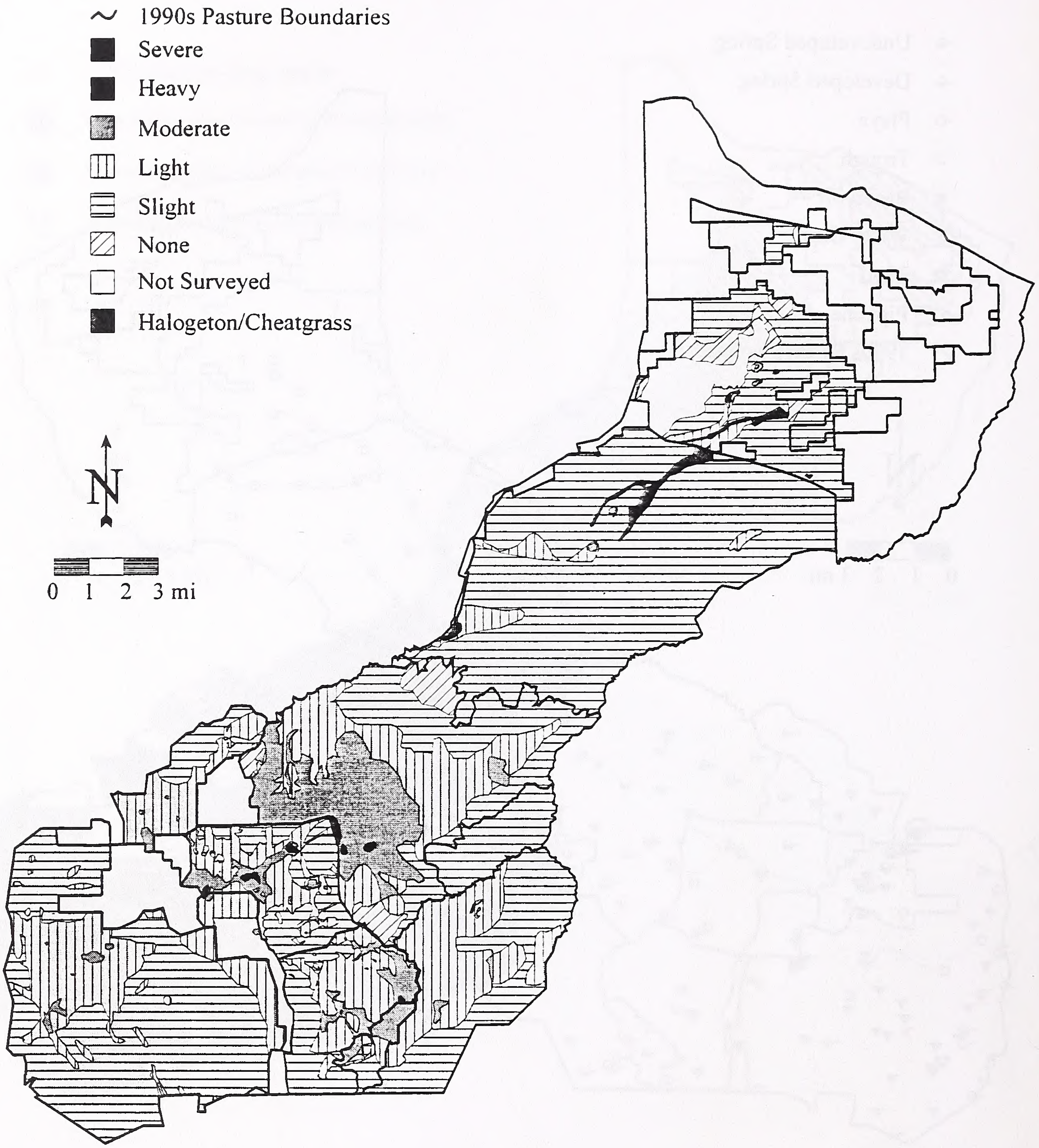
Map 12. Ecological condition based on the 1980 condition updated in 1997 to include wildfires since 1980, Battle Creek Allotment.


1990s Pasture Boundaries
Decreaser grass dominated understory
Increaser grass dominated understory
Annual grass dominated understory
N
0 1 2 3 mi

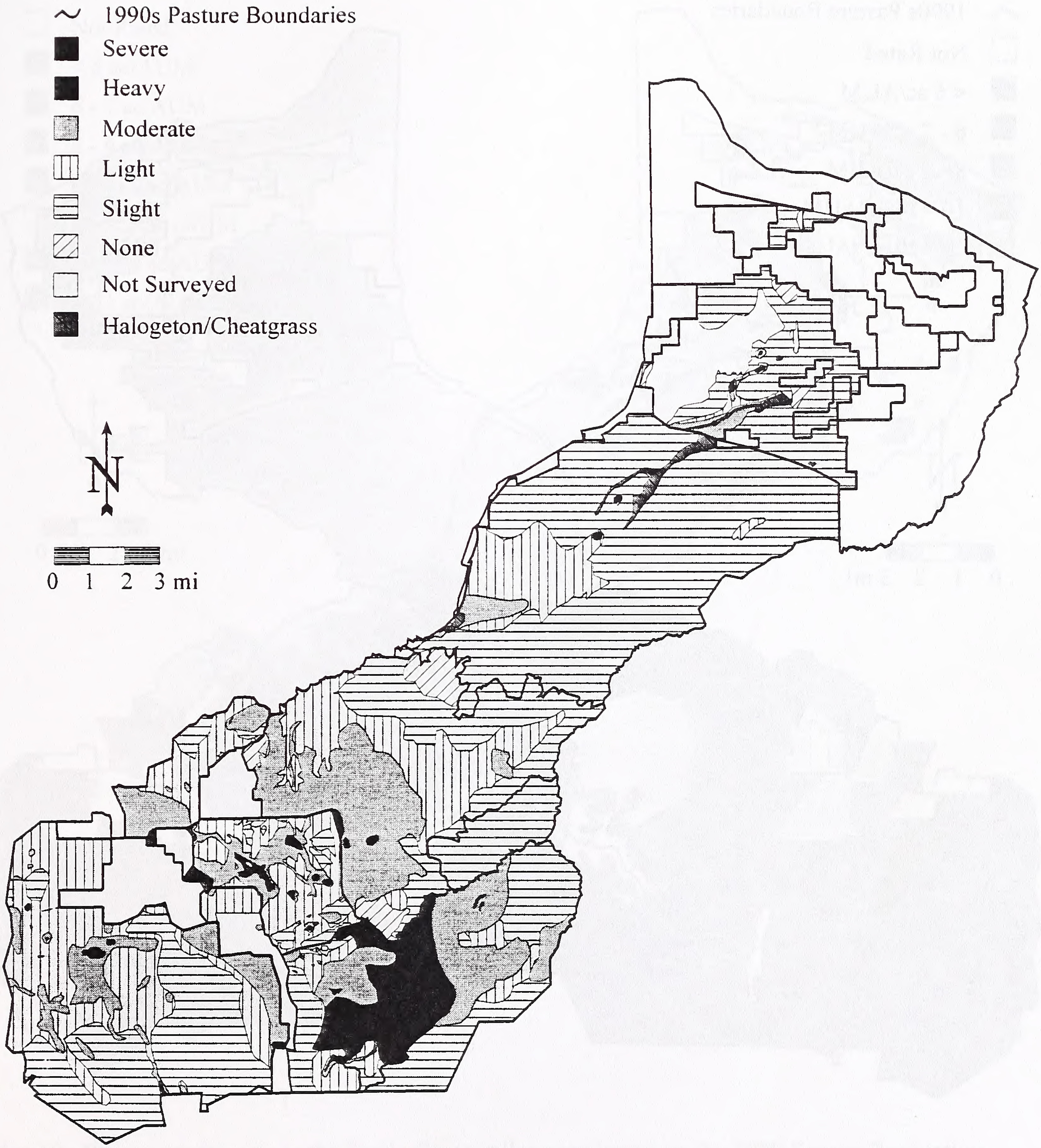
Map 13. Shrub understory dominance based on 1980 Ecological Site Inventory step-point ground cover data, Battle Creek Allotment.



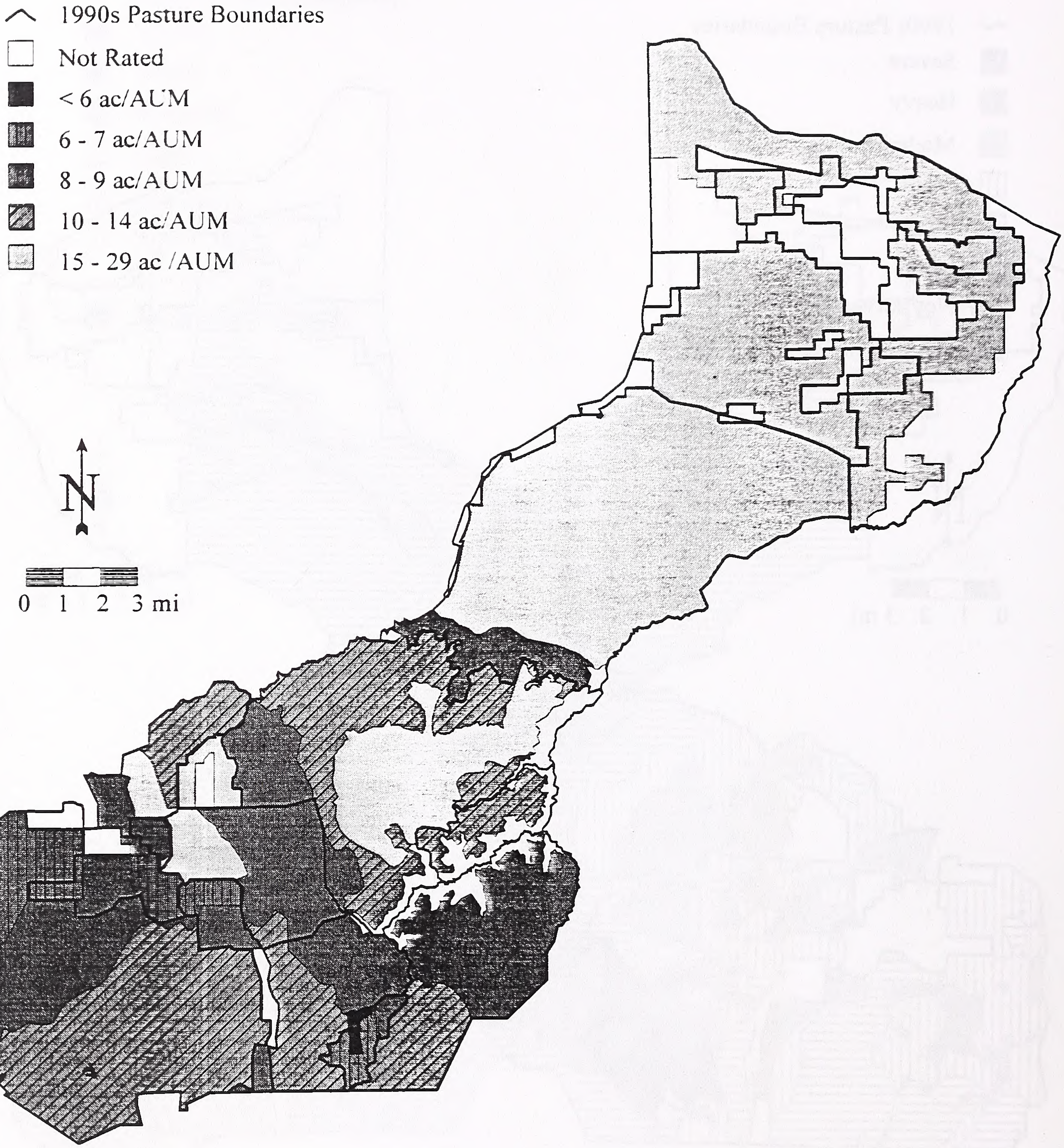
Map 14. Location of range improvement projects, Battle Creek Allotment.



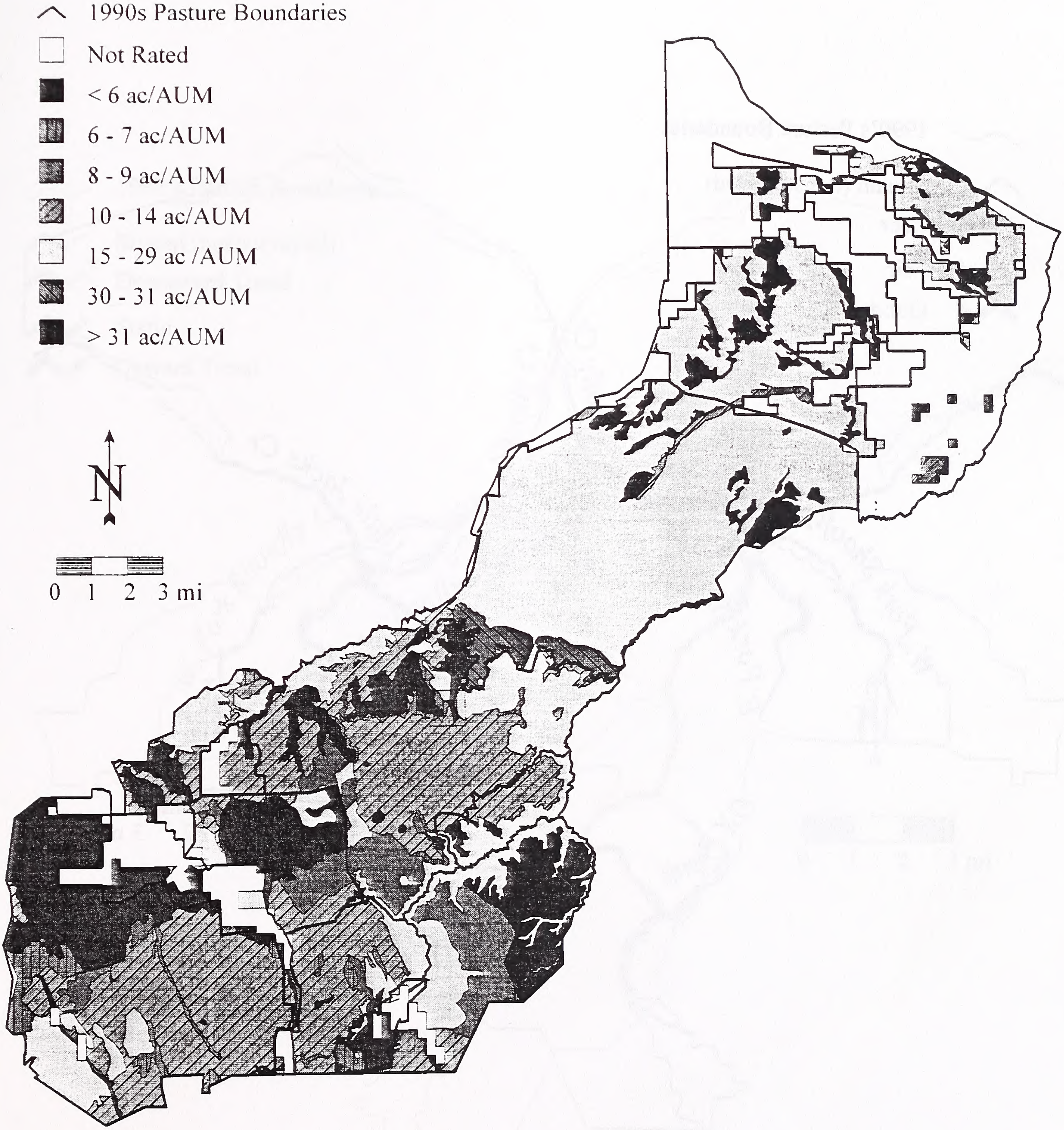
Map 15. Average utilization between 1992 and 1997, Battle Creek Allotment.



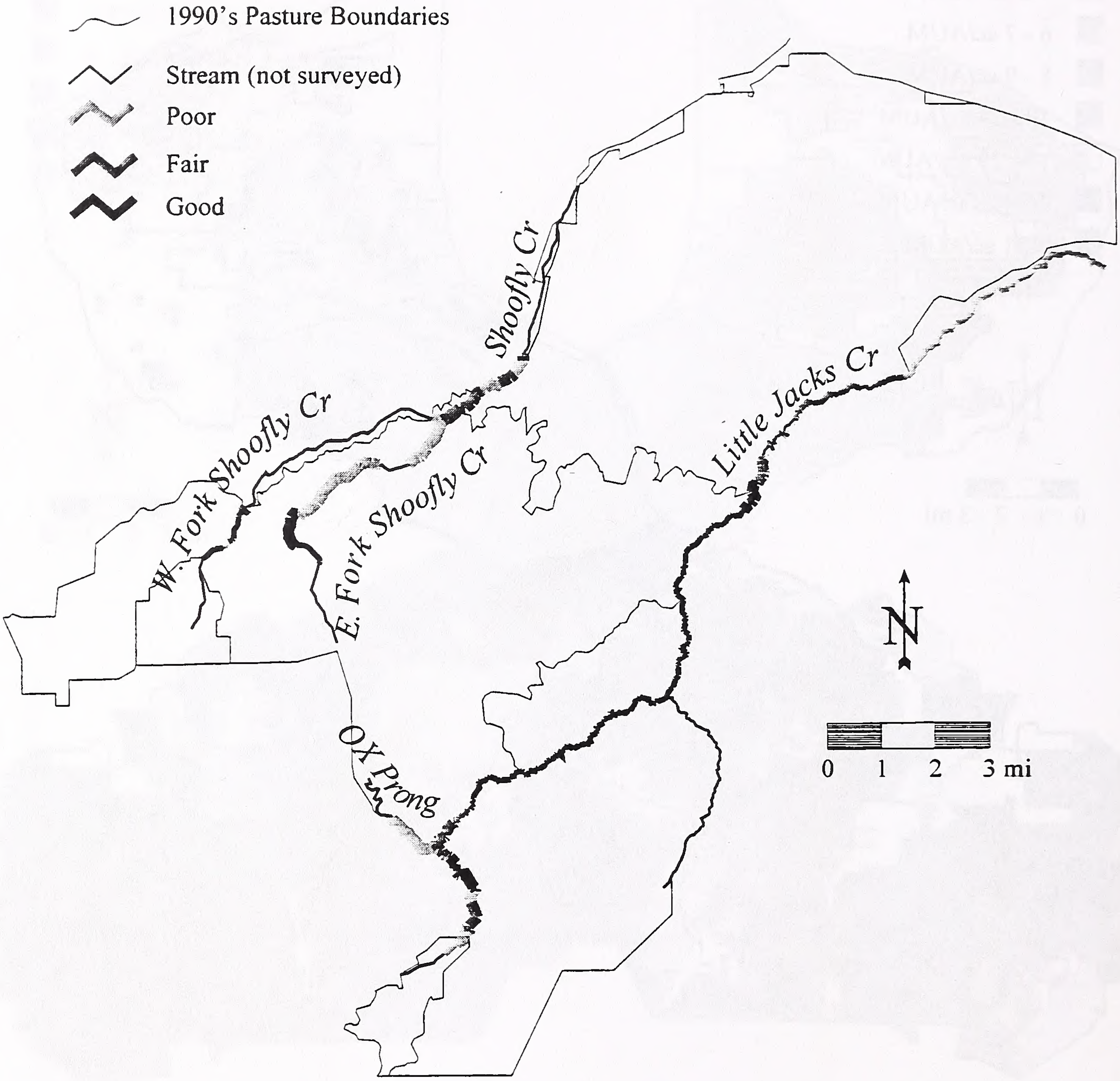
Map 16. Maximum utilization between 1992 and 1997, Battle Creek Allotment.



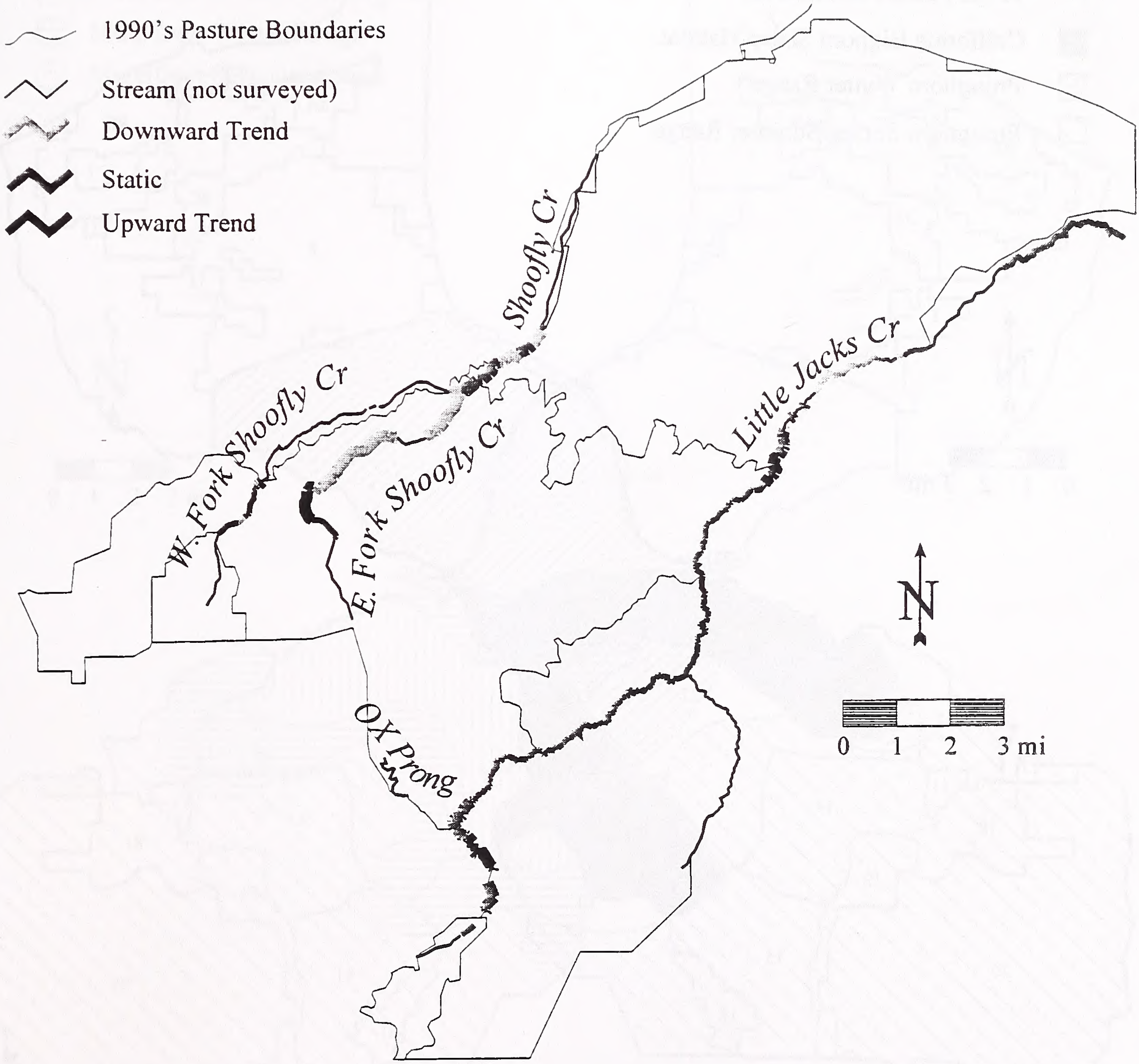
Map 17. Forage production in the Battle Creek Allotment based on the 1965 Forage Production Inventory adjusted to allocate 50% of perennial grass and 20% of annual grass production to livestock.



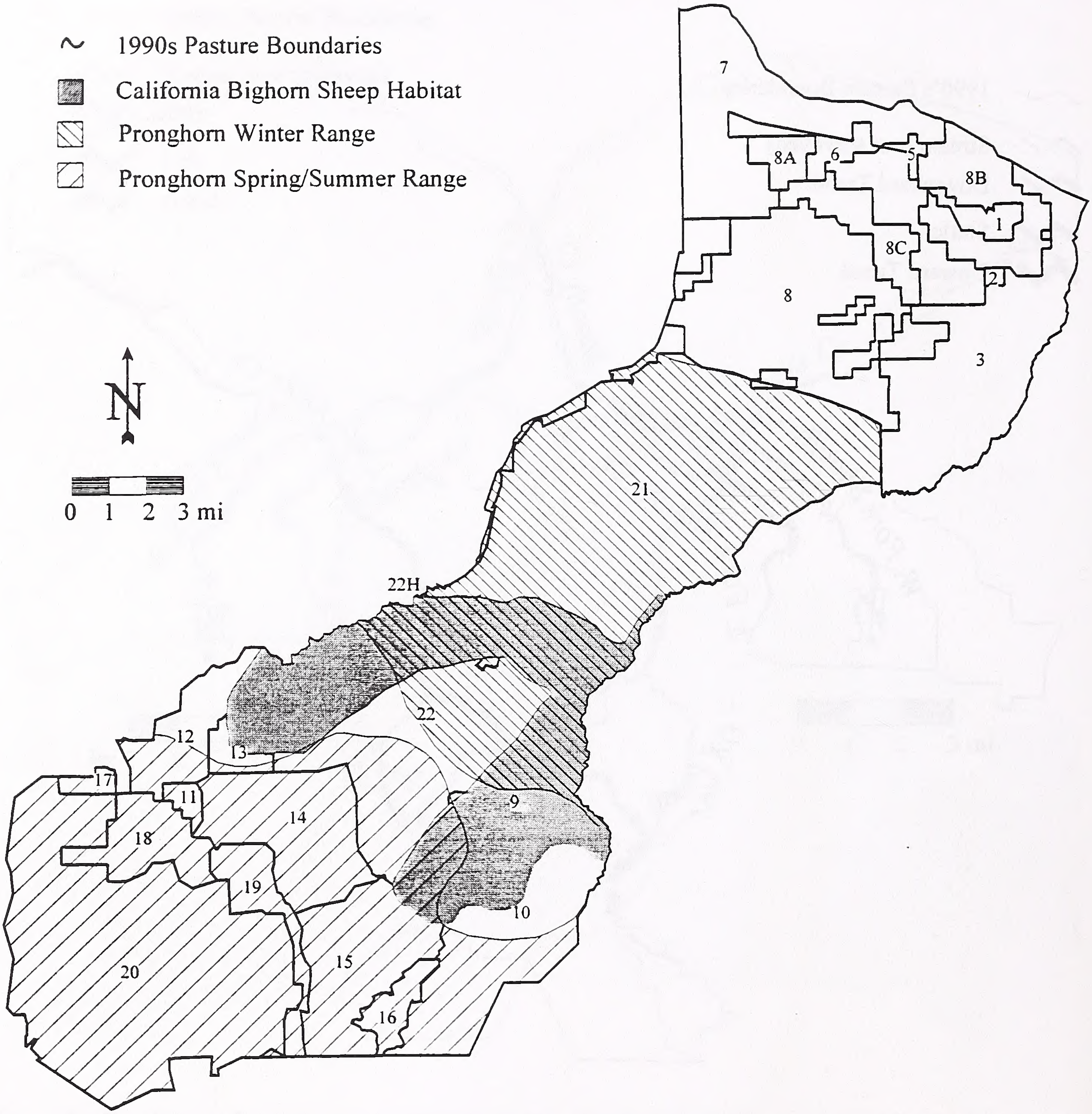
Map 18. Forage production in the Battle Creek Allotment based on the 1980 Forage Production Inventory adjusted to allocate 50% of perennial grass and 20% of annual grass production to livestock.



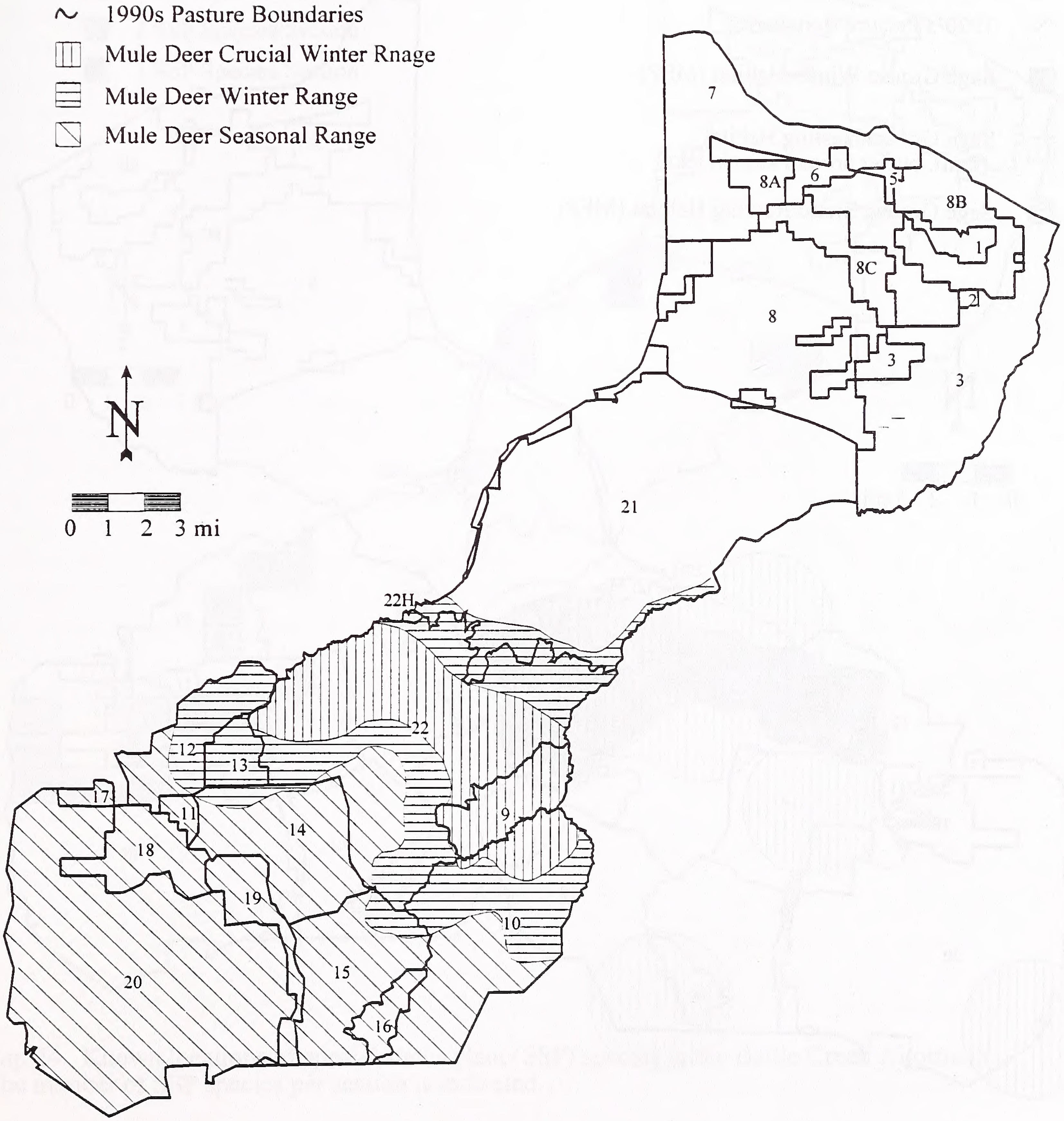
Map 19. Condition of riparian/aquatic habitat in the Battle Creek Allotment, 1994-95. Stream segments identified for improvement in the Bruneau MFP (1983) are indicated by wider line segments.



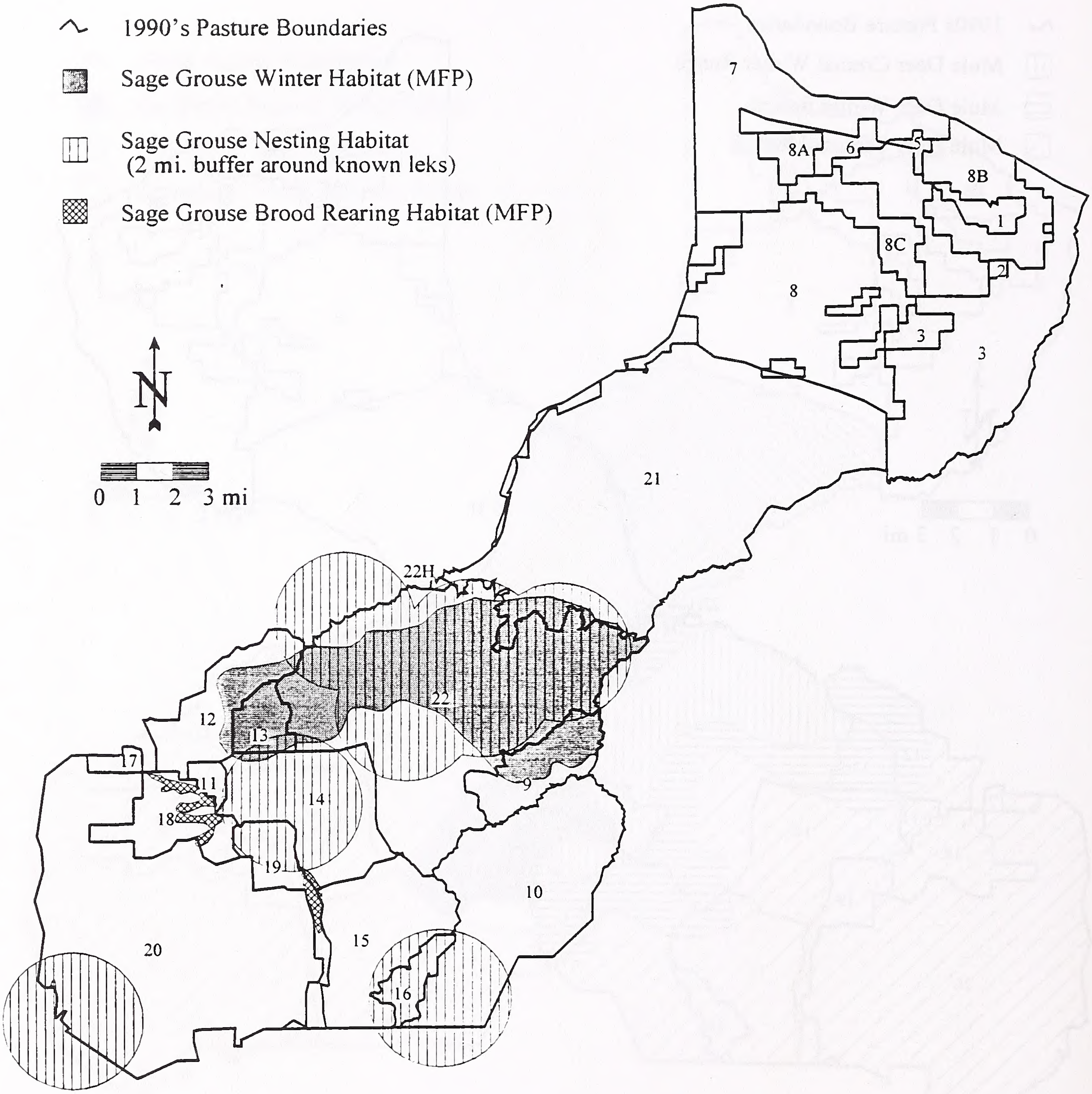
Map 20. Trend in riparian/aquatic habitat of streams in the Battle Creek Allotment, 1983-95. Stream segments identified for improvement in the Bruneau MFP (1983) are indicated by wider line segments.



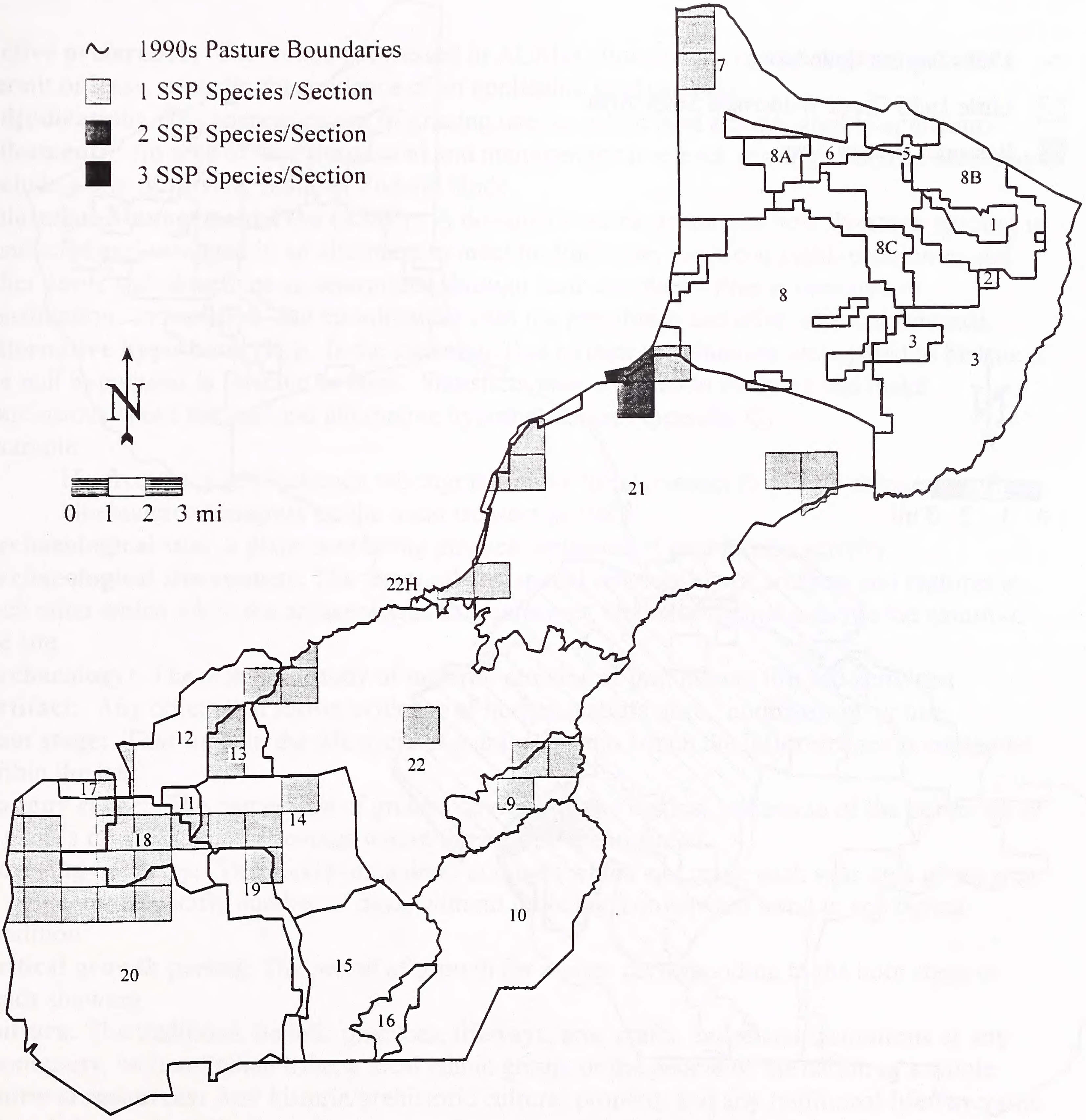
Map 21. California bighorn sheep and pronghorn winter and spring/summer habitats in the Battle Creek Allotment, as identified in the Bruneau MFP (1983).



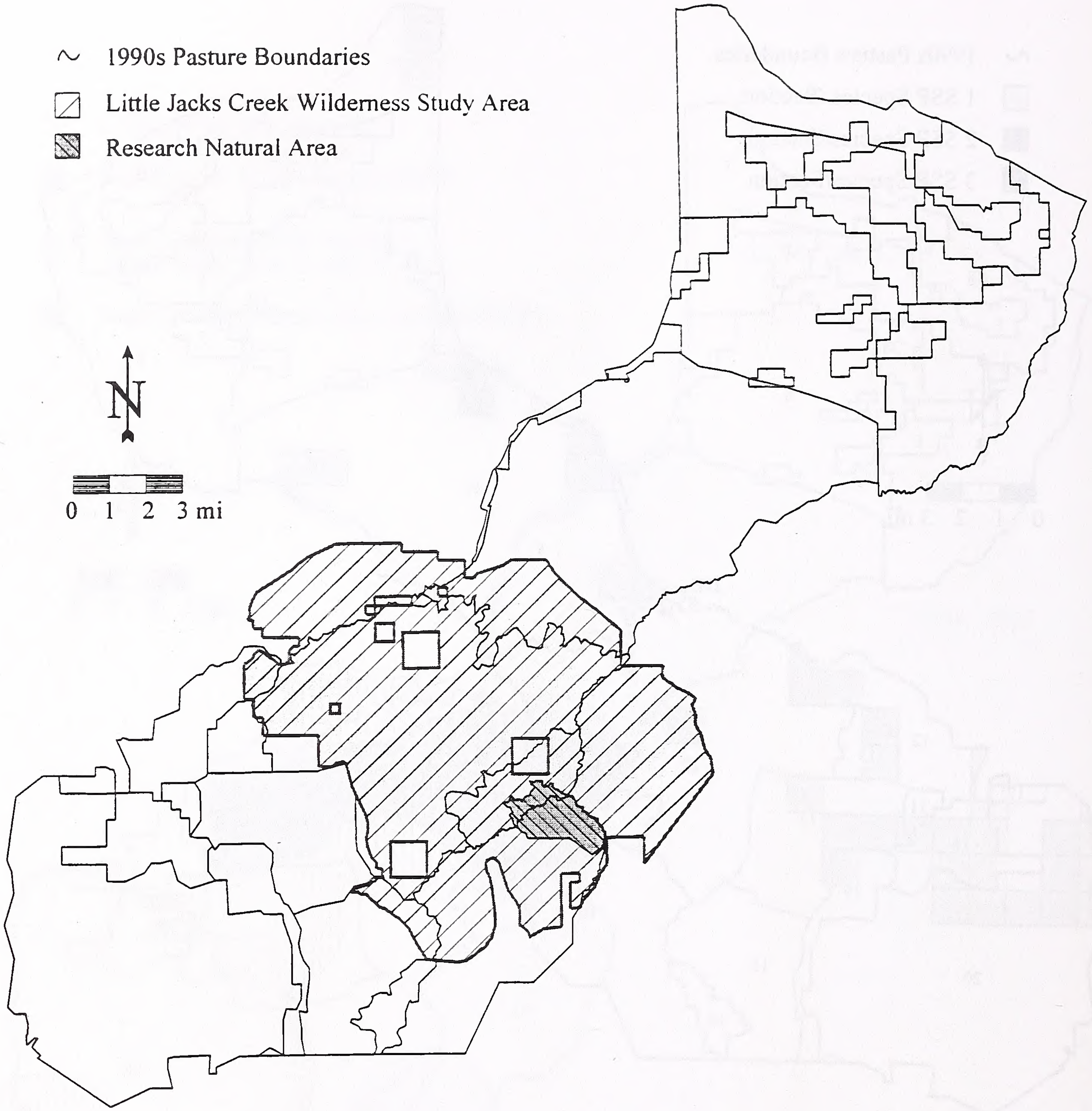
Map 22. Mule deer winter and crucial winter and seasonal ranges in the Battle Creek Allotment, as identified in the Bruneau MFP (1983).


1990's Pasture Boundaries
Sage Grouse Winter Habitat (MFP)
Sage Grouse Nesting Habitat
(2 mi. buffer around known leks)
Sage Grouse Brood Rearing Habitat (MFP)
N
0 1 2 3 mi
7
8A
6
5
8B
1
8C
2
8
3
3
21
22H
22
12
13
17
11
14
18
9
19
10
15
20
16

Map 23. Sage grouse lek/nesting, brood rearing, and wintering areas in the Battle Creek Allotment. Nesting areas were defined as a 2-mile radius around known leks identified between 1990-97. Sage grouse brood rearing and wintering areas were identified in the Bruneau MFP (1983).



Map 24. Known locations of special status plant (SSP) species in the Battle Creek Allotment. The number of SSP species per section is indicated.



Map 25. Locations of special management areas in the Battle Creek Allotment.

XV. GLOSSARY

Active preference: The forage (expressed in AUMs) allocated for livestock grazing under a permit or lease, or under the guidance of an applicable land use plan.
Adjudication: The apportionment of grazing use on public land among eligible applicants.
Allotment: An area of land designated and managed for livestock grazing. Such an area may include a mix of private, State, or Federal lands.
Allotment Management Plan (AMP): A document which prescribes how livestock grazing is conducted and managed in an allotment to meet multiple use, sustained yield, economic, and other needs and objectives as determined through land use plans. Plan is prepared in consultation, cooperation, and coordination with the permittees and other affected interests.
Alternative hypothesis (H_1): Is the statement that reflects the situation anticipated to be true if the null hypothesis is rejected as false. Statistical tests are used to examine and make conclusions about the null and alternative hypotheses (see Appendix C).
Example:

> H_1: frequency of bluebunch wheatgrass on the trend transect in 1993 $\neq$ frequency of bluebunch wheatgrass on the trend transect in 1983.

Archaeological site: a place containing physical evidence of past human activity.
Archaeological site context: The temporal and spatial relationship of artifacts and features to each other which allow the archaeologist to reconstruct, characterize and analyze the nature of the site.
Archaeology: The scientific study of material remains of past human life and activities.
Artifact: Any object that shows evidence of human manufacture, modification, or use.
Boot stage: That stage in the life cycle of a grass plant in which the inflorescence is contained within the leaf.
Canopy cover: The percentage of ground covered by the vertical projection of the perimeter of a plant's foliage. Small openings within the canopy are included.
Carrying capacity: The maximum animal numbers which can graze each year on a given area of range, for a specific number of days, without inducing a downward trend in ecological condition.
Critical growth period: The period of growth for a plant corresponding to the boot stage or heads showing.
Culture: The traditions, beliefs, practices, lifeways, arts, crafts, and social institutions of any community, be it an Indian tribe, a local ethnic group, or the people of the nation as a whole.
Cultural resources: Any historic/prehistoric cultural property and any traditional lifeway value.
Class 1 demand: Adjudicated grazing preference established during the priority years between 1936 and 1941..
Climax community: The final or stable biotic community; the natural potential community in a successional series.
Decreaser: Plants that are most preferred by grazing animals and show the first signs of grazing stress: as grazing continues these palatable plants die and their abundance in the community

decreases. Examples of decreaser grasses include Indian ricegrass, Idaho fescue, bluebunch wheatgrass, and Thurber's needlegrass.

Deferred use: Delay of livestock grazing on an area for an adequate period of time to provide for plant reproduction, establishment of new plants, or restoration of vigor of existing plants.

Deming Two Phase Survey: This vegetation monitoring method gives equivalent but separate ratings to the two most significant phases of the range resource complex; the forage stand, and site and soil mantle of the habitat. The ratings for these two phases are used in combination for comprehensive classification of range condition.

Density: The number of individuals per unit area. Plant density is not a measure of cover.

Depleted: Plant community has a well-distributed understory of Sandberg bluegrass and/or squirreltail, but only scattered remnants of decreaser grasses, with or without a cheatgrass component. In terms of ecological condition, this community type would have potential for slow improvement in ecological condition if decreaser remnants are present, and high potential for improvement in vigor and abundance of increasers.

Depletion rating(s): The categories (extremely depleted, depleted, and undepleted) are based on consistent breaks in the relative composition of increaser and decreaser grasses in seral shrub communities.

Desertification: The process by which an area or region becomes more arid through loss of soil and vegetative cover. The process is often accelerated by excessive and continuous overstocking and drought.

Ecological condition: A classification system that compares the present state of vegetation of a range site to the climax plant community for that site. Four classes are used to express the degree to which the composition of the present plant community reflects that of the climax: poor, fair, good, and excellent.

Ecological site: An area with a specific potential natural community and specific physical site characteristics, differing from other sites in its ability to produce vegetation and to respond to management. Synonymous with range site.

Ecological Site Inventory: Provides necessary ecological information to develop resource management objectives, make sound management decisions, and provide a baseline from which to evaluate objectives.

Effective rooting depth (ERD): The depth of soil material readily penetrated by roots for water and nutrients.

Ethnography: Descriptive and analytic study of the culture of particular groups or communities. An ethnographer seeks to understand a community through interviews with its members and often through living in and observing it (a practice referred to as "participant observation").

Extensive browse method: A monitoring method using a 100 point pace transect to collect data on utilization, species composition, age class, form class, availability, and hedging for the browse component of a plant community.

Extremely depleted (ED): A classification for a plant community with few perennial grasses, either increasers and decreasers. This community type could have primarily a bare ground or cheatgrass understory with some remnants of perennial grasses. This community has very little potential for natural improvement in ecological condition. Colonization of bare areas by increaser grasses would be slow.

Fenced Federal Range (FFR): Pasture or allotment comprised of small, isolated parcel(s) of public land surrounded by and fenced in with larger parcels of private land. BLM has no authority over the private lands, but retains authority and responsibility for the resources on the public lands. Grazing use must be in conformance with LUP objectives.

Forage production: The amount of forage that is produced within a specific period on a given area. The weight may be expressed as either green, air-dry, or oven-dry.

Frequency: The ratio between the number of sample units that contain a species and the total number of sample units.

Grazed class method: A monitoring method used to estimate forage utilization by livestock. A photo guide is used to estimate how much of a plant was utilized.

Grazing agreement: An agreement between the BLM, permittees, and interested public regarding the terms and conditions of grazing use in a specific area.

Grazing method: A defined procedure or technique of grazing management designed to achieve a specific objective(s).

Grazing system: A defined, integrated combination of animal, plant, soil, and other environmental components and the grazing method(s) by which the system is managed to achieve specific results or goals.

Greenline: The first continuous cover of perennial vegetation above the stable low water level, either along or above the stream bank.

Ground cover: The percentage of material covering the soil surface. Ground cover plus bare ground totals to 100%.

Hypothesis: An explanation for a set of facts that can be tested by further investigation.

Increaser: A plant species that under continued disturbance (e.g, heavy grazing, fire, drought) increases in abundance, at least for a time, relative to the other plants in the community. Examples of increaser grasses include Sandberg bluegrass and squirreltail.

Invader: A plant species that was absent in undisturbed portions of the original plant community and invades or increases following disturbance or continued heavy grazing.

Inventory: The systematic acquisition and analysis of resource information used to describe, characterize, or quantify resources for land-use planning and management.

Key area(s): A relatively small portion of a range selected because of its location, use, or grazing value as a monitoring point for grazing use. It is assumed that key areas, if properly selected, will reflect the overall acceptability of current grazing management over the range.

Key forage plant method: A method used to ocularly estimate forage utilization by livestock into one of six utilization classes. Observations are made of the appearance of the rangeland and especially the key species, along a transect which traverses the key area.

Key species: **(1)** Forage species of sufficient abundance and palatability to justify its use as an indicator to the degree of use of associated species. **(2)** Those species which must, because of their importance, be considered in the management program.

Lakebeds segment (Snake River Plains): Fan terraces and lakebed deposits in the 7 to 10 inch precipitation zone, supporting Wyoming big sagebrush and salt desert shrub plant communities.

Landscape stratification: A technique for delineating diverse rangeland units (allotment, pasture, wildlife habitat area, herd management area, watershed area, etc.) into smaller, homogeneous units with similar physical and/or biological characteristics.
Litter: The uppermost layer of organic material on the soil surface; essentially the freshly fallen or slightly decomposed vegetal material.
Mountain segment: Granitic and rhyolitic mountains in the 8 to 16 inch precipitation zone supporting Wyoming big sagebrush, black sagebrush, low sagebrush, and mountain big sagebrush communities.
Mycorhizal: In fungi, the combination of the fungus and the root of a vascular plant.
National Register of Historic Places: A list of a wide range of historic and pre-historic property types, reflecting the diversity of the nation's history and culture. Buildings, structures, and sites; groups of buildings, structures or sites forming historic districts; landscapes; individual objects and traditional cultural properties are included.
National Range Handbook (NRH): A handbook instrumental in outlining the National Resource Conservation Service authority, policy, and procedures for range inventory and conservation activities.
Null hypothesis (H_o): Is the hypothesis being examined. It is usually, but not always, worded in a way that reflects the status quo (no change or difference). Statistical tests are used to examine and make conclusions about the hypothesis (see Appendix C).
Example:

> H_0: frequency of bluebunch wheatgrass on the trend transect in 1993 = frequency of bluebunch wheatgrass on the trend transect in 1983.

Perennial: A plant that has a life span of 3 or more years.
Persistent litter: Litter which continues to exist in place for over two years. It consists of woody material and large mammal droppings.
Phenology: The changing phases of activity of a plant that are repeated each season in response to weather and climate, such as the development of new foliage, pollination, root growth, seed dissemination.
Plant community: An assemblage of populations of plants in a given area.
Plant vigor: The relative robustness of a plant in comparison to other individuals of the same species. It is reflected primarily by the size of a plant and its parts in relation to its age and the environment in which it is growing.
Plateau segment: A rolling rhyolitic plateau in the 12 to 16 inch precipitation zone, supporting mountain and basin big sagebrush, low sagebrush, mountain mahogany, and juniper communities.
Potential natural plant community: The biotic community which would become established on an ecological site if all successional sequences were completed without interferences under the present environmental conditions.
Probability (P): The value used in statistical tests to evaluate whether the null hypothesis is true. If the probability is small (generally < 0.05 [5%]), then it is concluded that it is unlikely the null hypothesis is true, and therefore the null hypothesis is rejected and the alternate hypothesis is accepted as true (see Appendix C for additional information).

Proper use: A degree of utilization of current year's growth, which if continued will maintain or improve the long-term productivity of the site.

Proper use factor: An index to the grazing use that may be made of a specific forage species, based on a system of range management that will maintain the economically important forage species, or achieve other management objectives such as maintenance of watersheds, recreation values, etc.

Rangeline agreement: An agreement between livestock permittees and the BLM to establish or adjust range allotment boundaries.

Range condition: A rating for current condition of plant communities relative to potential communities for the area. The rating is based upon the relative proportion of decreasers, increasers, and invaders comprising the community. This concept is generally similar to ecological condition.

Range site: An area of rangeland which has the potential to produce and sustain distinctive kinds and amounts of vegetation to result in a characteristic plant community under its particular combination of environmental factors, particularly climate, soils, and associated native biota.

Rangeland suitability: The adaptability of a range to grazing by livestock and/or wildlife. The major criteria used are: distance from water; slope or other physical barriers; forage production; and soil surface factor.

Rare plant : Any plant species that is limited in its distribution. It may be rare naturally or as a result of human impacts.

Sensitive plant: A plant species designated as sensitive by a BLM State Director. Receives at least the same attention as a candidate plant (proposed for listing as threatened or endangered under the federal Endangered Species Act).

Seral stage(s): One of a series of biotic communities that follow one another in time on any given area. Synonymous with seral community.

Significant difference: When the probability of the null hypothesis (ie. frequency of bluebunch wheatgrass plants in spring pastures did not change between 1983 and 1993) being true is less than 5% ($P \leq 0.05$), then the alternative hypothesis (that the samples differ) is accepted as true.

Site writeup area (SWA): The smallest delineated geographic unit on which vegetation data is collected, using the following criteria: 1) an entire range site if it is all in one condition class and present vegetative community; 2) a portion of a range site if more than one seral stage and present vegetation community exists within the range site; or 3) a complex if two or more present plant communities and/or range sites exist in a soil complex or association where separation is not practical.

Soil mapping unit: A classification of a unit of soil that differs from its adjoining units in the landscape in one or more properties to such a degree that the combinations of all the properties result in different responses to management for growing plants, to engineering manipulations, or to other uses that require appreciable investment.

Soil series: A group of soils that are similar, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Soil surface factor (SSF): An expression of current erosion activity. Both wind and water erosion are considered. Seven surface categories are soil movement, surface litter, surface rock, pedestaling, rills, flow patterns, and gullies. The SSF values may provide an indication of changes in erosion activity over time under various intensities of use.

Special status plant: Refers to a plant species that is either Federally listed as threatened or endangered, officially proposed for Federal listing as endangered or threatened, a candidate for Federal listing as endangered or threatened, State listed as endangered or threatened (or other such category), or listed by a BLM State Director as sensitive.

Stand depletion: A rating system used to describe the understory composition of seral plant communities.

Step-point ground cover: A monitoring method used to estimate the amount of ground covered by both living vegetation and litter.

Stocking rate: The number of specific kinds and classes of animals grazing or utilizing a unit of land for a specified period. May be expressed as animal unit months or animal unit days per acre, hectare, or section, or the reciprocal (area of land/ animal unit month or day).

Traditional cultural property: A property that is eligible for inclusion in the National Register of Historic Places because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

Trend: The direction of change in ecological status or resource value rating of a plant community observed over time.

Undepleted: A definition of a plant community that has good remnants of both increaser and decreaser grasses both in shrub interspaces and beneath the shrubs, although the shrub component may have increased relative to pristine condition. These communities would be equivalent to high fair or better ecological condition, and would have high potential for improvement in ecological condition.

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